



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 12, 2026 – 02:31 AM UTC

PDB ID : 1RRK / pdb_00001rrk
Title : Crystal Structure Analysis of the Bb segment of Factor B
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Deposited on : 2003-12-08
Resolution : 2.00 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

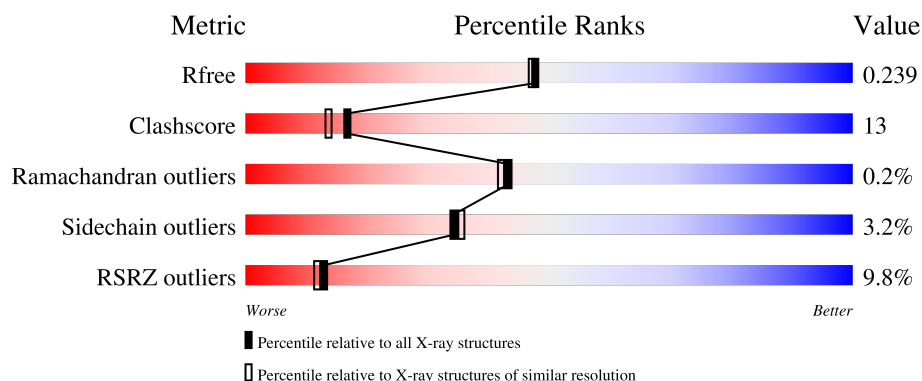
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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}	180053	10052 (2.00-2.00)
Clashscore	190562	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (2.00-2.00)
RSRZ outliers	180081	10067 (2.00-2.00)

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 $\leq 5\%$. 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	497	9% 75% 20% ...

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 4010 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 Complement factor B.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	480	Total	C	N	O	S	0	0	0
			3740	2378	636	705	21			

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	267	VAL	CYS	engineered mutation	UNP P00751
A	428	CYS	PHE	engineered mutation	UNP P00751
A	435	CYS	ASN	engineered mutation	UNP P00751

- Molecule 2 is IODIDE ION (CCD ID: IOD) (formula: I).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	2	Total I 2 2	0	0

- Molecule 3 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	7	Total Na 7 7	0	0

- Molecule 4 is COBALT (II) ION (CCD ID: CO) (formula: Co).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total Co 1 1	0	0

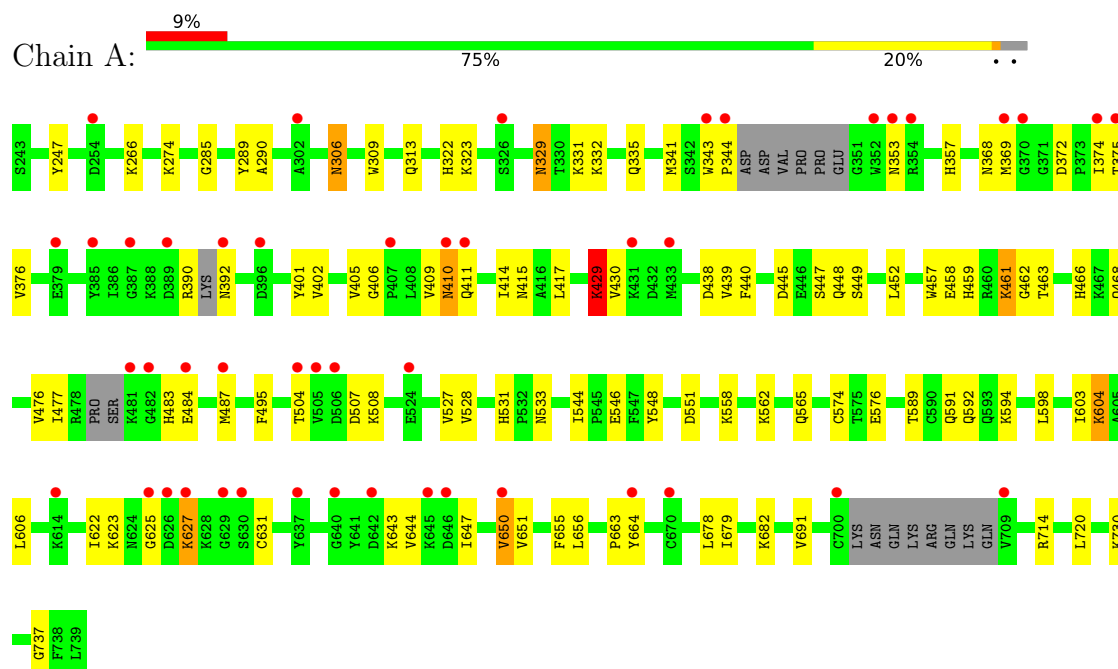
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	260	Total 260	O 260	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 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: Complement factor B



4 Data and refinement statistics

Property	Value	Source
Space group	P 61	Depositor
Cell constants a, b, c, α , β , γ	98.98Å 98.98Å 126.43Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	19.67 – 2.00 19.67 – 2.00	Depositor EDS
% Data completeness (in resolution range)	96.0 (19.67-2.00) 96.0 (19.67-2.00)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.95 (at 2.00Å)	Xtriage
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.220 , 0.245 0.216 , 0.239	Depositor DCC
R_{free} test set	1365 reflections (2.91%)	wwPDB-VP
Wilson B-factor (Å ²)	29.5	Xtriage
Anisotropy	0.104	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.39 , 50.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.047 for h,-h-k,-l	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	4010	wwPDB-VP
Average B, all atoms (Å ²)	34.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.78% 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 ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: IOD, CO, NA

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	0.39	0/3816	0.92	14/5167 (0.3%)

There are no bond length outliers.

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	495	PHE	N-CA-C	8.29	122.92	109.40
1	A	679	ILE	N-CA-C	7.81	120.88	108.85
1	A	678	LEU	N-CA-C	-7.04	97.25	108.73
1	A	406	GLY	CA-C-N	6.50	126.20	119.64
1	A	406	GLY	C-N-CA	6.50	126.20	119.64
1	A	468	GLN	CA-C-N	6.46	126.39	119.28
1	A	468	GLN	C-N-CA	6.46	126.39	119.28
1	A	656	LEU	N-CA-C	-6.35	99.86	109.95
1	A	655	PHE	N-CA-C	5.97	119.78	110.17
1	A	429	LYS	N-CA-C	-5.76	100.61	109.76
1	A	458	GLU	N-CA-C	5.72	120.25	113.16
1	A	344	PRO	N-CA-CB	5.72	109.29	103.00
1	A	285	GLY	N-CA-C	-5.53	101.26	111.04
1	A	574	CYS	N-CA-C	5.27	118.66	111.39

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	3740	0	3665	95	0
2	A	2	0	0	2	0
3	A	7	0	0	0	0
4	A	1	0	0	0	0
5	A	260	0	0	8	0
All	All	4010	0	3665	95	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 13.

All (95) 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:411:GLN:HE22	1:A:429:LYS:NZ	1.38	1.20
1:A:411:GLN:NE2	1:A:429:LYS:HZ3	1.46	1.09
1:A:411:GLN:NE2	1:A:429:LYS:NZ	1.97	1.09
1:A:604:LYS:HB2	1:A:604:LYS:HZ3	1.32	0.94
1:A:374:ILE:HD13	1:A:417:LEU:HD23	1.50	0.90
1:A:508:LYS:HA	1:A:508:LYS:HE2	1.52	0.90
1:A:531:HIS:HD2	1:A:533:ASN:H	1.27	0.82
1:A:459:HIS:HD2	1:A:461:LYS:H	1.30	0.80
1:A:411:GLN:HE22	1:A:429:LYS:HZ3	0.99	0.79
1:A:410:ASN:C	1:A:410:ASN:HD22	1.91	0.78
1:A:429:LYS:HE3	1:A:429:LYS:HA	1.66	0.78
1:A:411:GLN:NE2	1:A:429:LYS:HZ2	1.79	0.77
1:A:323:LYS:HB2	5:A:856:HOH:O	1.85	0.76
1:A:476:VAL:HB	1:A:484:GLU:HB3	1.66	0.75
1:A:306:ASN:C	1:A:306:ASN:HD22	1.96	0.73
1:A:459:HIS:CD2	1:A:461:LYS:H	2.11	0.68
1:A:445:ASP:OD2	1:A:448:GLN:HG2	1.95	0.67
1:A:591:GLN:HE22	1:A:594:LYS:NZ	1.96	0.64
1:A:544:ILE:CD1	1:A:650:VAL:HG12	2.29	0.63
1:A:508:LYS:HE2	1:A:508:LYS:CA	2.28	0.63
1:A:463:THR:H	1:A:466:HIS:HD2	1.46	0.62
1:A:411:GLN:NE2	5:A:995:HOH:O	2.31	0.62
1:A:463:THR:H	1:A:466:HIS:CD2	2.17	0.61
1:A:504:THR:HG22	1:A:507:ASP:OD2	2.00	0.61
1:A:589:THR:OG1	1:A:592:GLN:HG3	2.01	0.61
1:A:604:LYS:HB2	1:A:604:LYS:NZ	2.12	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:647:ILE:O	1:A:650:VAL:HG22	2.02	0.60
1:A:409:VAL:CG1	1:A:414:ILE:HD12	2.31	0.60
1:A:531:HIS:CD2	1:A:533:ASN:H	2.14	0.59
1:A:372:ASP:O	1:A:375:THR:HG22	2.03	0.59
1:A:405:VAL:HG22	1:A:430:VAL:HG21	1.85	0.57
1:A:643:LYS:HG2	5:A:833:HOH:O	2.05	0.56
1:A:527:VAL:HG22	1:A:528:VAL:N	2.20	0.56
1:A:606:LEU:C	1:A:606:LEU:HD12	2.31	0.56
1:A:289:TYR:HA	1:A:322:HIS:CE1	2.41	0.56
1:A:544:ILE:HG12	1:A:650:VAL:HG12	1.86	0.56
1:A:247:TYR:OH	1:A:357:HIS:HD2	1.89	0.55
1:A:353:ASN:ND2	5:A:968:HOH:O	2.41	0.54
1:A:329:ASN:C	1:A:329:ASN:HD22	2.16	0.53
1:A:329:ASN:ND2	1:A:332:LYS:H	2.07	0.52
1:A:323:LYS:CB	5:A:856:HOH:O	2.51	0.51
1:A:576:GLU:HG3	1:A:737:GLY:O	2.10	0.51
1:A:410:ASN:C	1:A:410:ASN:ND2	2.63	0.51
1:A:650:VAL:HG23	1:A:651:VAL:HG23	1.92	0.51
1:A:487:MET:SD	5:A:942:HOH:O	2.60	0.50
1:A:390:ARG:O	1:A:392:ASN:N	2.44	0.50
1:A:429:LYS:HE3	1:A:429:LYS:CA	2.40	0.50
1:A:504:THR:HG22	1:A:507:ASP:CG	2.37	0.49
1:A:368:ASN:OD1	1:A:369:MET:HG3	2.13	0.49
1:A:457:TRP:CZ3	1:A:459:HIS:HB3	2.47	0.49
1:A:374:ILE:HD13	1:A:417:LEU:CD2	2.33	0.48
1:A:341:MET:HE2	1:A:357:HIS:CD2	2.48	0.48
1:A:477:ILE:HG13	1:A:483:HIS:NE2	2.28	0.48
1:A:402:VAL:CG1	1:A:414:ILE:HG23	2.44	0.48
1:A:274:LYS:HE3	1:A:440:PHE:CE2	2.49	0.48
1:A:663:PRO:HG2	1:A:664:TYR:HD1	1.79	0.48
1:A:591:GLN:NE2	1:A:594:LYS:HE2	2.29	0.48
1:A:663:PRO:HG2	1:A:664:TYR:CD1	2.49	0.48
1:A:309:TRP:O	1:A:313:GLN:HG2	2.14	0.47
1:A:650:VAL:CG2	1:A:651:VAL:N	2.76	0.47
1:A:466:HIS:HE1	2:A:741:IOD:I	2.67	0.47
1:A:598:LEU:HA	1:A:603:ILE:HD13	1.96	0.47
1:A:411:GLN:OE1	1:A:415:ASN:ND2	2.48	0.47
1:A:625:GLY:C	1:A:627:LYS:H	2.22	0.47
1:A:644:VAL:HG11	1:A:650:VAL:HG13	1.97	0.47
1:A:459:HIS:HD2	1:A:461:LYS:HB2	1.80	0.47
1:A:544:ILE:CG1	1:A:650:VAL:HG12	2.45	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:650:VAL:CG2	1:A:651:VAL:HG23	2.46	0.46
1:A:438:ASP:OD2	1:A:459:HIS:HE1	1.98	0.46
1:A:623:LYS:HE3	1:A:663:PRO:HD2	1.96	0.46
1:A:631:CYS:SG	1:A:714:ARG:HD2	2.56	0.46
1:A:459:HIS:CD2	1:A:461:LYS:HB2	2.51	0.46
1:A:477:ILE:HG13	1:A:483:HIS:CE1	2.52	0.45
1:A:591:GLN:HE22	1:A:594:LYS:CE	2.29	0.45
1:A:457:TRP:CH2	1:A:459:HIS:HB3	2.52	0.45
1:A:306:ASN:C	1:A:306:ASN:ND2	2.69	0.44
1:A:691:VAL:HG23	1:A:720:LEU:HD21	1.99	0.44
1:A:449:SER:HB3	1:A:452:LEU:HD22	1.99	0.44
1:A:650:VAL:HG23	1:A:651:VAL:N	2.34	0.43
1:A:329:ASN:HD21	1:A:331:LYS:HB3	1.82	0.43
1:A:449:SER:HA	1:A:452:LEU:HD13	2.00	0.43
1:A:603:ILE:HB	1:A:622:ILE:HB	2.01	0.42
1:A:331:LYS:O	1:A:335:GLN:HG3	2.20	0.42
1:A:531:HIS:HE1	2:A:740:IOD:I	2.72	0.42
1:A:682:LYS:HE3	5:A:919:HOH:O	2.18	0.42
1:A:445:ASP:OD2	1:A:447:SER:OG	2.30	0.42
1:A:462:GLY:HA3	5:A:795:HOH:O	2.20	0.41
1:A:375:THR:HG23	1:A:376:VAL:N	2.35	0.41
1:A:306:ASN:ND2	1:A:309:TRP:H	2.17	0.41
1:A:643:LYS:O	1:A:643:LYS:HG3	2.21	0.41
1:A:644:VAL:HG11	1:A:650:VAL:CG1	2.51	0.41
1:A:562:LYS:N	1:A:562:LYS:HD2	2.36	0.40
1:A:730:LYS:HA	1:A:730:LYS:HD3	1.93	0.40
1:A:401:TYR:CE1	1:A:439:VAL:HG13	2.56	0.40
1:A:548:TYR:O	1:A:551:ASP:HB2	2.22	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	470/497 (95%)	453 (96%)	16 (3%)	1 (0%)	43 42

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	290	ALA

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	406/439 (92%)	393 (97%)	13 (3%)	34 35

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	266	LYS
1	A	306	ASN
1	A	329	ASN
1	A	343	TRP
1	A	410	ASN
1	A	429	LYS
1	A	461	LYS
1	A	546	GLU
1	A	558	LYS
1	A	565	GLN
1	A	604	LYS
1	A	627	LYS
1	A	650	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (19) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	260	ASN
1	A	270	ASN

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Mol	Chain	Res	Type
1	A	306	ASN
1	A	313	GLN
1	A	315	ASN
1	A	318	ASN
1	A	329	ASN
1	A	357	HIS
1	A	410	ASN
1	A	411	GLN
1	A	413	ASN
1	A	415	ASN
1	A	423	ASN
1	A	459	HIS
1	A	466	HIS
1	A	531	HIS
1	A	565	GLN
1	A	591	GLN
1	A	681	HIS

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](#)

Of 10 ligands modelled in this entry, 10 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

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(Å ²)	Q<0.9
1	A	480/497 (96%)	0.52	47 (9%) 13 12	20, 34, 49, 68	0

All (47) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	343	TRP	4.9
1	A	344	PRO	4.9
1	A	650	VAL	4.7
1	A	385	TYR	4.3
1	A	389	ASP	4.2
1	A	484	GLU	4.1
1	A	505	VAL	3.7
1	A	375	THR	3.6
1	A	352	TRP	3.4
1	A	670	CYS	3.1
1	A	630	SER	3.0
1	A	431	LYS	3.0
1	A	504	THR	2.9
1	A	700	CYS	2.8
1	A	392	ASN	2.7
1	A	302	ALA	2.7
1	A	407	PRO	2.7
1	A	709	VAL	2.7
1	A	646	ASP	2.7
1	A	642	ASP	2.6
1	A	374	ILE	2.6
1	A	433	MET	2.6
1	A	370	GLY	2.5
1	A	637	TYR	2.5
1	A	626	ASP	2.5
1	A	353	ASN	2.5
1	A	640	GLY	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	629	GLY	2.4
1	A	379	GLU	2.3
1	A	625	GLY	2.3
1	A	254	ASP	2.3
1	A	664	TYR	2.3
1	A	506	ASP	2.3
1	A	387	GLY	2.3
1	A	411	GLN	2.2
1	A	326	SER	2.2
1	A	614	LYS	2.2
1	A	487	MET	2.2
1	A	482	GLY	2.2
1	A	524	GLU	2.1
1	A	354	ARG	2.1
1	A	369	MET	2.1
1	A	410	ASN	2.1
1	A	627	LYS	2.1
1	A	396	ASP	2.0
1	A	481	LYS	2.0
1	A	645	LYS	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(Å ²)	Q<0.9
3	NA	A	748	1/1	0.89	0.17	41,41,41,41	0
3	NA	A	747	1/1	0.90	0.20	38,38,38,38	0
3	NA	A	746	1/1	0.94	0.14	27,27,27,27	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	NA	A	745	1/1	0.95	0.24	25,25,25,25	0
3	NA	A	742	1/1	0.95	0.23	21,21,21,21	0
4	CO	A	749	1/1	0.96	0.39	38,38,38,38	0
3	NA	A	744	1/1	0.97	0.21	21,21,21,21	0
3	NA	A	743	1/1	0.97	0.25	18,18,18,18	0
2	IOD	A	740	1/1	0.99	0.03	34,34,34,34	0
2	IOD	A	741	1/1	0.99	0.06	34,34,34,34	0

6.5 Other polymers [i](#)

There are no such residues in this entry.