



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 07:57 PM UTC

PDB ID : 3QQ2 / pdb\_00003qq2  
Title : Crystal Structure of the Beta Domain of the Bordetella Autotransporter Brka  
Authors : Zhai, Y.; Zhang, K.; Huo, Y.; Sun, F.  
Deposited on : 2011-02-14  
Resolution : 3.00 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](mailto: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>.

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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

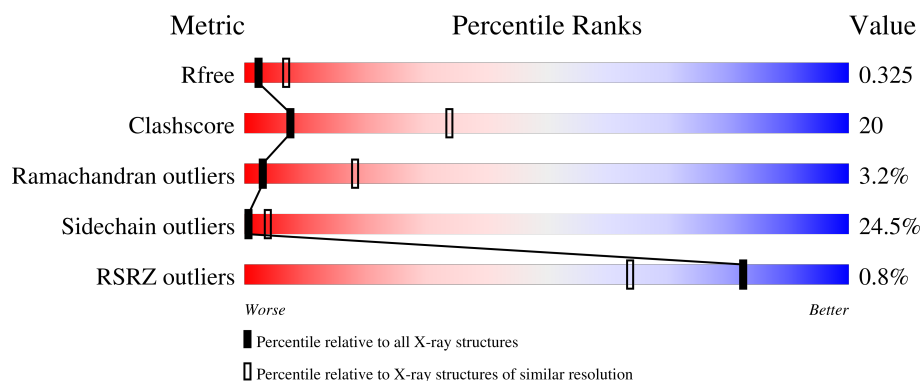
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 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))
$R_{free}$	180053	2672 (3.00-3.00)
Clashscore	190562	2977 (3.00-3.00)
Ramachandran outliers	187476	2877 (3.00-3.00)
Sidechain outliers	187428	2880 (3.00-3.00)
RSRZ outliers	180081	2671 (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  $\geq 3$ , 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	284	
1	B	284	
1	C	284	

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 5772 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 BrkA autotransporter.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	245	Total	C	N	O	S	0	0	0
			1899	1196	350	352	1			
1	B	250	Total	C	N	O	S	0	0	0
			1942	1220	363	358	1			
1	C	249	Total	C	N	O	S	0	0	0
			1931	1214	359	357	1			

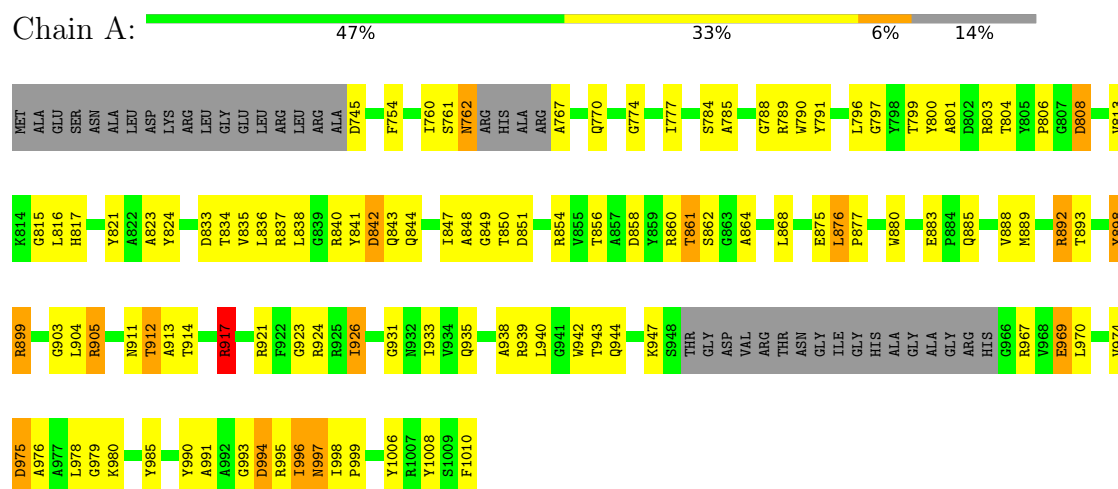
There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	727	MET	LEU	engineered mutation	UNP Q45340
B	727	MET	LEU	engineered mutation	UNP Q45340
C	727	MET	LEU	engineered mutation	UNP Q45340

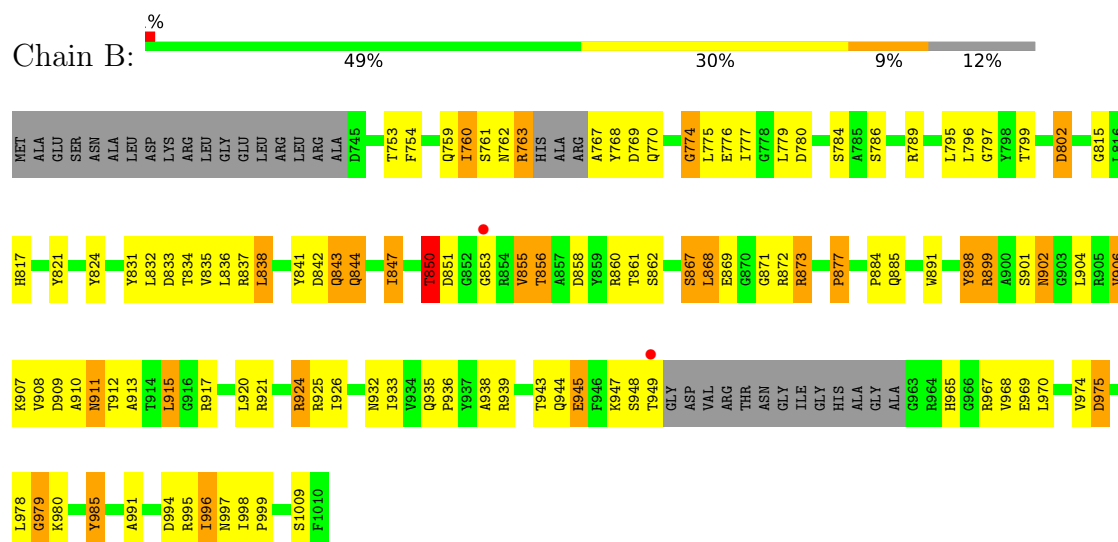
### 3 Residue-property plots

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: BrkA autotransporter

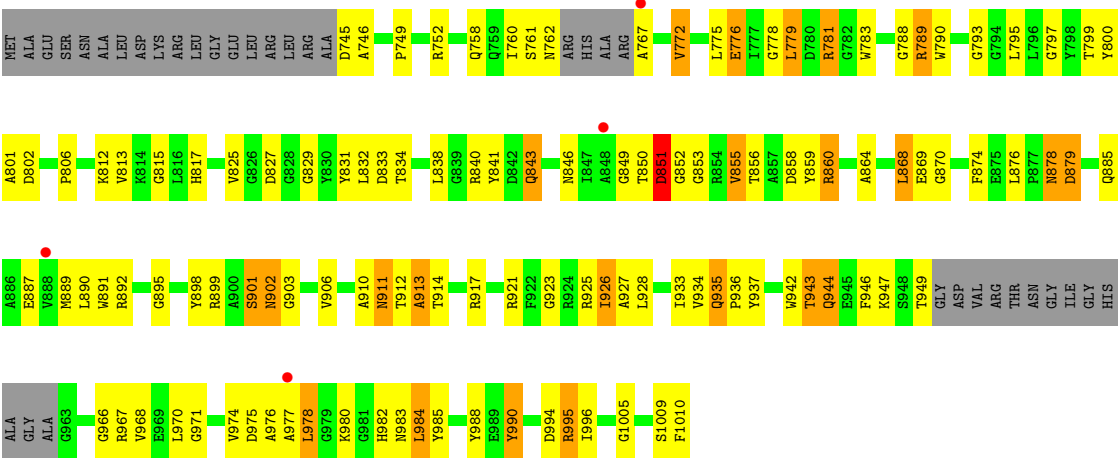


#### • Molecule 1: BrkA autotransporter



#### • Molecule 1: BrkA autotransporter





## 4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	60.51Å 122.37Å 405.55Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	15.00 – 3.00 15.00 – 3.00	Depositor EDS
% Data completeness (in resolution range)	96.7 (15.00-3.00) 95.7 (15.00-3.00)	Depositor EDS
$R_{merge}$	0.14	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.43 (at 2.91Å)	Xtriage
Refinement program	REFMAC 5.5.0088	Depositor
R, $R_{free}$	0.266 , 0.324 0.267 , 0.325	Depositor DCC
$R_{free}$ test set	1574 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	81.0	Xtriage
Anisotropy	0.301	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.28 , 45.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.43$ , $\langle L^2 \rangle = 0.26$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.89	EDS
Total number of atoms	5772	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	92.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.91% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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 ⓘ

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	0.79	0/1947	1.04	3/2630 (0.1%)
1	B	0.75	0/1991	0.99	4/2688 (0.1%)
1	C	0.62	0/1980	0.93	4/2674 (0.1%)
All	All	0.72	0/5918	0.99	11/7992 (0.1%)

There are no bond length outliers.

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	815	GLY	N-CA-C	8.74	123.32	110.38
1	C	859	TYR	N-CA-C	6.52	117.07	107.88
1	B	867	SER	N-CA-C	6.48	118.89	107.61
1	A	913	ALA	N-CA-C	6.40	119.58	108.76
1	A	926	ILE	N-CA-C	6.22	116.98	107.77
1	C	913	ALA	N-CA-C	5.48	116.96	109.18
1	C	935	GLN	N-CA-C	5.41	117.94	108.75
1	A	917	ARG	N-CA-C	5.17	116.84	108.26
1	C	983	ASN	N-CA-C	5.11	116.96	109.24
1	B	774	GLY	N-CA-C	5.09	120.75	110.97
1	B	841	TYR	N-CA-C	5.09	117.55	109.50

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	1899	0	1797	72	0
1	B	1942	0	1840	95	0
1	C	1931	0	1827	73	0
All	All	5772	0	5464	227	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 20.

All (227) 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:C:925:ARG:HD2	1:C:933:ILE:CG2	1.60	1.30
1:C:925:ARG:CD	1:C:933:ILE:HG21	1.66	1.26
1:A:815:GLY:HA3	1:A:841:TYR:CE2	1.88	1.08
1:A:917:ARG:HD3	1:A:943:THR:HB	1.42	1.00
1:B:911:ASN:HB2	1:B:949:THR:HB	1.48	0.95
1:A:815:GLY:HA3	1:A:841:TYR:CD2	2.02	0.95
1:B:924:ARG:HH11	1:B:926:ILE:HG22	1.29	0.95
1:B:763:ARG:HH21	1:B:995:ARG:HH12	1.00	0.93
1:B:763:ARG:HH21	1:B:995:ARG:NH1	1.67	0.92
1:C:925:ARG:CD	1:C:933:ILE:CG2	2.37	0.90
1:B:996:ILE:HD13	1:B:996:ILE:N	1.88	0.88
1:A:905:ARG:HG3	1:A:905:ARG:HH11	1.39	0.88
1:B:831:TYR:CE1	1:B:871:GLY:HA3	2.10	0.86
1:C:925:ARG:HG3	1:C:933:ILE:HG23	1.58	0.85
1:A:892:ARG:HG3	1:A:912:THR:HB	1.58	0.83
1:B:873:ARG:HH11	1:B:873:ARG:HG2	1.41	0.83
1:A:924:ARG:NH1	1:A:926:ILE:HD11	1.95	0.82
1:B:996:ILE:HD13	1:B:996:ILE:H	1.44	0.82
1:B:924:ARG:HG3	1:B:926:ILE:HG23	1.62	0.82
1:A:1008:TYR:HD1	1:A:1010:PHE:H	1.26	0.82
1:A:924:ARG:HG2	1:A:926:ILE:HG13	1.61	0.81
1:C:925:ARG:CG	1:C:933:ILE:HG23	2.10	0.81
1:B:763:ARG:NH2	1:B:995:ARG:NH1	2.28	0.80
1:B:763:ARG:NH2	1:B:995:ARG:HH12	1.78	0.80
1:C:815:GLY:HA3	1:C:841:TYR:CE2	2.21	0.76
1:B:965:HIS:HB3	1:B:995:ARG:HD2	1.67	0.76
1:C:978:LEU:HB3	1:C:982:HIS:HB2	1.67	0.75
1:A:754:PHE:CE1	1:A:774:GLY:HA3	2.22	0.74
1:B:996:ILE:N	1:B:996:ILE:CD1	2.50	0.74
1:A:924:ARG:NH1	1:A:926:ILE:CD1	2.51	0.73
1:C:925:ARG:CG	1:C:933:ILE:CG2	2.66	0.73

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:917:ARG:HD3	1:A:943:THR:CB	2.19	0.73
1:A:924:ARG:HG2	1:A:926:ILE:CG1	2.19	0.73
1:B:898:TYR:HD1	1:B:898:TYR:H	1.36	0.73
1:B:924:ARG:HG3	1:B:926:ILE:CG2	2.19	0.73
1:B:873:ARG:HH11	1:B:873:ARG:CG	2.03	0.72
1:B:872:ARG:O	1:B:884:PRO:HD2	1.89	0.71
1:B:844:GLN:HG3	1:B:858:ASP:OD1	1.89	0.71
1:B:991:ALA:HB3	1:B:998:ILE:HB	1.72	0.71
1:A:847:ILE:HG22	1:A:848:ALA:H	1.57	0.70
1:B:797:GLY:HA3	1:B:817:HIS:CE1	2.27	0.70
1:A:847:ILE:HG22	1:A:848:ALA:N	2.07	0.69
1:A:917:ARG:HH11	1:A:917:ARG:HB2	1.57	0.69
1:B:763:ARG:HE	1:B:995:ARG:NH1	1.90	0.69
1:B:760:ILE:HG12	1:B:768:TYR:CE1	2.27	0.69
1:A:940:LEU:HD23	1:B:920:LEU:HD22	1.74	0.69
1:A:944:GLN:HE22	1:B:877:PRO:HB2	1.58	0.69
1:C:925:ARG:HG3	1:C:933:ILE:CG2	2.23	0.69
1:B:760:ILE:HG12	1:B:768:TYR:CZ	2.28	0.68
1:B:763:ARG:NE	1:B:995:ARG:HH11	1.93	0.67
1:B:898:TYR:CD1	1:B:898:TYR:N	2.61	0.66
1:A:921:ARG:HB3	1:A:939:ARG:HG3	1.78	0.66
1:C:925:ARG:HD2	1:C:933:ILE:HG21	0.75	0.66
1:B:856:THR:HG22	1:B:856:THR:O	1.96	0.65
1:A:762:ASN:HD22	1:A:767:ALA:HB2	1.62	0.65
1:A:924:ARG:HH11	1:A:926:ILE:HD11	1.59	0.65
1:A:762:ASN:H	1:A:762:ASN:ND2	1.94	0.64
1:C:834:THR:HB	1:C:868:LEU:HD23	1.78	0.64
1:B:873:ARG:HG2	1:B:873:ARG:NH1	2.13	0.64
1:B:850:THR:HG22	1:B:851:ASP:H	1.62	0.63
1:C:934:VAL:HG12	1:C:936:PRO:HD3	1.80	0.63
1:B:924:ARG:CG	1:B:926:ILE:CG2	2.77	0.62
1:B:763:ARG:NE	1:B:995:ARG:NH1	2.47	0.62
1:C:885:GLN:HE22	1:C:921:ARG:HG2	1.65	0.62
1:C:911:ASN:HB3	1:C:949:THR:HA	1.82	0.62
1:C:994:ASP:O	1:C:995:ARG:HB3	1.99	0.61
1:C:815:GLY:HA3	1:C:841:TYR:CD2	2.35	0.61
1:C:899:ARG:N	1:C:899:ARG:HD3	2.14	0.61
1:B:837:ARG:O	1:B:838:LEU:HD13	2.00	0.61
1:B:965:HIS:HD2	1:B:995:ARG:HH21	1.49	0.60
1:B:924:ARG:HH11	1:B:926:ILE:CG2	2.11	0.60
1:A:898:TYR:N	1:A:898:TYR:CD2	2.69	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:785:ALA:HB2	1:A:790:TRP:HD1	1.67	0.59
1:B:925:ARG:HD3	1:B:933:ILE:CG2	2.33	0.58
1:C:935:GLN:HB3	1:C:975:ASP:HB2	1.85	0.58
1:B:917:ARG:HG3	1:B:943:THR:HB	1.85	0.58
1:B:762:ASN:HD22	1:B:767:ALA:HB2	1.68	0.57
1:A:940:LEU:CD2	1:B:920:LEU:HD22	2.34	0.57
1:B:847:ILE:HG12	1:B:855:VAL:HG13	1.86	0.57
1:C:800:TYR:CZ	1:C:802:ASP:HB2	2.38	0.57
1:A:789:ARG:HG2	1:A:791:TYR:HE1	1.69	0.57
1:B:844:GLN:CG	1:B:858:ASP:OD1	2.53	0.56
1:C:797:GLY:HA3	1:C:817:HIS:CE1	2.40	0.56
1:C:758:GLN:HE21	1:C:772:VAL:HG21	1.71	0.56
1:C:885:GLN:NE2	1:C:921:ARG:HG2	2.21	0.56
1:B:763:ARG:CZ	1:B:995:ARG:NH1	2.69	0.56
1:B:965:HIS:CD2	1:B:995:ARG:HH21	2.24	0.56
1:A:997:ASN:O	1:A:999:PRO:HD3	2.06	0.56
1:C:850:THR:O	1:C:851:ASP:HB3	2.05	0.56
1:A:898:TYR:O	1:A:899:ARG:HB3	2.06	0.55
1:B:925:ARG:HD3	1:B:933:ILE:HG21	1.87	0.55
1:A:815:GLY:HA3	1:A:841:TYR:HE2	1.65	0.55
1:B:776:GLU:CD	1:B:837:ARG:HH21	2.14	0.55
1:A:933:ILE:O	1:A:976:ALA:HA	2.06	0.55
1:C:752:ARG:NH2	1:C:776:GLU:OE1	2.40	0.54
1:A:788:GLY:HA3	1:A:824:TYR:CE1	2.42	0.54
1:B:899:ARG:HH11	1:B:899:ARG:HB3	1.73	0.54
1:B:924:ARG:NH1	1:B:926:ILE:HG22	2.12	0.54
1:C:878:ASN:O	1:C:879:ASP:HB2	2.07	0.54
1:C:976:ALA:HB3	1:C:984:LEU:HB2	1.90	0.53
1:C:761:SER:HB2	1:C:995:ARG:HA	1.89	0.53
1:B:842:ASP:OD1	1:B:860:ARG:HG2	2.08	0.53
1:A:849:GLY:C	1:A:851:ASP:H	2.17	0.53
1:A:880:TRP:HA	1:A:923:GLY:O	2.08	0.53
1:B:947:LYS:HG3	1:B:948:SER:H	1.74	0.53
1:B:965:HIS:CB	1:B:995:ARG:HD2	2.35	0.53
1:C:851:ASP:O	1:C:853:GLY:N	2.42	0.53
1:A:990:TYR:HD2	1:A:998:ILE:O	1.92	0.53
1:A:821:TYR:C	1:A:821:TYR:CD2	2.87	0.52
1:A:970:LEU:HD12	1:B:970:LEU:HD12	1.90	0.52
1:B:780:ASP:HB3	1:B:821:TYR:OH	2.09	0.52
1:B:761:SER:HB3	1:B:995:ARG:HA	1.92	0.52
1:B:926:ILE:O	1:B:926:ILE:HG13	2.08	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:970:LEU:HD21	1:B:938:ALA:HB1	1.92	0.52
1:A:789:ARG:HG2	1:A:791:TYR:CE1	2.45	0.52
1:A:797:GLY:HA3	1:A:817:HIS:CE1	2.45	0.52
1:C:840:ARG:HD3	1:C:860:ARG:CZ	2.40	0.52
1:C:869:GLU:HG2	1:C:870:GLY:N	2.24	0.52
1:A:880:TRP:HA	1:A:924:ARG:HA	1.92	0.52
1:C:901:SER:O	1:C:903:GLY:N	2.42	0.52
1:A:994:ASP:OD2	1:B:924:ARG:NH2	2.43	0.51
1:B:831:TYR:CE1	1:B:871:GLY:CA	2.92	0.51
1:A:754:PHE:CZ	1:A:774:GLY:HA3	2.46	0.50
1:A:975:ASP:HB3	1:A:985:TYR:CD2	2.46	0.50
1:C:942:TRP:HD1	1:C:968:VAL:HG22	1.76	0.50
1:C:797:GLY:HA3	1:C:817:HIS:NE2	2.27	0.50
1:A:847:ILE:CG2	1:A:848:ALA:N	2.75	0.50
1:B:762:ASN:HB3	1:B:767:ALA:N	2.26	0.50
1:B:856:THR:O	1:B:856:THR:CG2	2.59	0.50
1:C:942:TRP:CZ2	1:C:944:GLN:HB3	2.46	0.50
1:A:791:TYR:HB2	1:A:823:ALA:HB3	1.94	0.50
1:A:917:ARG:HB2	1:A:917:ARG:NH1	2.26	0.50
1:A:785:ALA:CB	1:A:790:TRP:HD1	2.23	0.50
1:A:834:THR:HB	1:A:868:LEU:HD23	1.93	0.50
1:C:788:GLY:HA3	1:C:827:ASP:OD2	2.11	0.50
1:A:842:ASP:OD1	1:A:860:ARG:HG2	2.12	0.49
1:B:947:LYS:HG3	1:B:948:SER:N	2.28	0.49
1:A:876:LEU:HB3	1:A:877:PRO:HD2	1.94	0.49
1:B:853:GLY:HA3	1:C:858:ASP:O	2.12	0.49
1:B:925:ARG:NH1	1:B:935:GLN:OE1	2.46	0.49
1:C:970:LEU:HD23	1:C:990:TYR:HD1	1.77	0.49
1:B:770:GLN:HA	1:B:802:ASP:O	2.13	0.49
1:C:758:GLN:HE21	1:C:772:VAL:CG2	2.25	0.49
1:C:892:ARG:HG3	1:C:912:THR:HG22	1.94	0.49
1:A:1008:TYR:CE1	1:A:1010:PHE:HA	2.47	0.49
1:B:891:TRP:NE1	1:B:913:ALA:HB3	2.28	0.49
1:B:901:SER:O	1:B:902:ASN:C	2.54	0.49
1:B:924:ARG:O	1:B:936:PRO:HD2	2.12	0.49
1:C:895:GLY:HA3	1:C:910:ALA:HB2	1.94	0.49
1:C:745:ASP:OD2	1:C:1009:SER:HB3	2.12	0.49
1:B:763:ARG:CZ	1:B:995:ARG:HH11	2.25	0.48
1:C:746:ALA:HA	1:C:789:ARG:HH12	1.78	0.48
1:C:913:ALA:HB2	1:C:947:LYS:HG3	1.94	0.48
1:B:843:GLN:OE1	1:B:861:THR:HG21	2.14	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:770:GLN:HB3	1:A:803:ARG:HG3	1.96	0.48
1:C:779:LEU:O	1:C:793:GLY:HA3	2.12	0.48
1:A:847:ILE:CG2	1:A:848:ALA:H	2.24	0.48
1:A:803:ARG:HG2	1:A:804:THR:H	1.78	0.48
1:C:788:GLY:CA	1:C:827:ASP:OD2	2.62	0.48
1:B:906:VAL:HG23	1:C:906:VAL:HG12	1.96	0.47
1:C:899:ARG:HD3	1:C:899:ARG:H	1.77	0.47
1:A:861:THR:CG2	1:A:862:SER:N	2.77	0.47
1:A:996:ILE:H	1:A:996:ILE:HG12	1.19	0.47
1:B:899:ARG:HB3	1:B:899:ARG:NH1	2.29	0.47
1:C:783:TRP:CE2	1:C:790:TRP:HB2	2.50	0.47
1:C:978:LEU:HB3	1:C:982:HIS:CB	2.43	0.47
1:A:905:ARG:HH11	1:A:905:ARG:CG	2.16	0.47
1:A:967:ARG:HB3	1:A:993:GLY:HA3	1.97	0.47
1:A:967:ARG:HB3	1:A:996:ILE:HG13	1.96	0.47
1:B:831:TYR:HE1	1:B:871:GLY:HA3	1.72	0.47
1:C:917:ARG:HG3	1:C:943:THR:HB	1.96	0.47
1:B:754:PHE:CE1	1:B:774:GLY:HA3	2.50	0.46
1:C:947:LYS:HE3	1:C:949:THR:HG22	1.97	0.46
1:B:909:ASP:O	1:B:911:ASN:N	2.48	0.46
1:B:824:TYR:HB3	1:B:832:LEU:HD12	1.98	0.46
1:A:942:TRP:CH2	1:A:944:GLN:HG2	2.50	0.46
1:A:938:ALA:HB1	1:B:970:LEU:HD21	1.98	0.45
1:B:915:LEU:HD11	1:B:945:GLU:OE1	2.17	0.45
1:C:781:ARG:HG2	1:C:783:TRP:HE3	1.81	0.45
1:A:970:LEU:HD12	1:B:970:LEU:CD1	2.47	0.45
1:B:967:ARG:HD3	1:B:996:ILE:CG1	2.46	0.45
1:C:985:TYR:HD1	1:C:1005:GLY:HA3	1.81	0.45
1:A:841:TYR:O	1:A:860:ARG:HA	2.17	0.45
1:A:801:ALA:HB3	1:A:813:VAL:HB	1.99	0.44
1:A:905:ARG:HG3	1:A:905:ARG:NH1	2.19	0.44
1:B:997:ASN:O	1:B:999:PRO:HD3	2.17	0.44
1:C:775:LEU:O	1:C:797:GLY:HA2	2.16	0.44
1:B:843:GLN:HE21	1:B:843:GLN:HB3	1.61	0.44
1:C:762:ASN:HD22	1:C:767:ALA:HB2	1.82	0.44
1:C:971:GLY:HA2	1:C:988:TYR:O	2.18	0.44
1:B:932:ASN:HD22	1:B:979:GLY:H	1.64	0.44
1:C:813:VAL:HG22	1:C:843:GLN:HB3	1.99	0.44
1:B:911:ASN:CB	1:B:949:THR:HB	2.34	0.44
1:A:800:TYR:HA	1:A:813:VAL:O	2.18	0.43
1:B:967:ARG:HD3	1:B:996:ILE:HG13	2.01	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:837:ARG:O	1:A:864:ALA:HA	2.18	0.43
1:C:933:ILE:HB	1:C:977:ALA:HB3	1.99	0.43
1:C:864:ALA:O	1:C:891:TRP:HA	2.18	0.43
1:C:749:PRO:HA	1:C:778:GLY:O	2.19	0.43
1:C:831:TYR:OH	1:C:885:GLN:HB3	2.19	0.42
1:B:898:TYR:HD2	1:C:849:GLY:HA3	1.85	0.42
1:C:942:TRP:CD1	1:C:968:VAL:HG22	2.54	0.42
1:B:847:ILE:CG1	1:B:855:VAL:HG13	2.48	0.42
1:C:869:GLU:HB2	1:C:887:GLU:HG3	2.01	0.42
1:C:846:ASN:C	1:C:846:ASN:HD22	2.27	0.42
1:B:921:ARG:HA	1:B:938:ALA:O	2.19	0.42
1:C:923:GLY:HA3	1:C:937:TYR:CB	2.50	0.42
1:B:906:VAL:HG11	1:C:855:VAL:HG21	2.00	0.42
1:B:834:THR:HA	1:B:867:SER:O	2.19	0.42
1:A:969:GLU:HB3	1:A:991:ALA:HB2	2.02	0.41
1:C:801:ALA:HB3	1:C:813:VAL:HB	2.02	0.41
1:C:926:ILE:HG13	1:C:927:ALA:N	2.34	0.41
1:B:891:TRP:CE2	1:B:913:ALA:HB3	2.55	0.41
1:B:898:TYR:HE2	1:C:853:GLY:HA3	1.86	0.41
1:A:745:ASP:HB3	1:A:791:TYR:OH	2.20	0.41
1:B:847:ILE:HG12	1:B:855:VAL:CG1	2.48	0.41
1:B:868:LEU:HD22	1:B:869:GLU:H	1.85	0.41
1:A:883:GLU:OE2	1:A:921:ARG:NH1	2.46	0.41
1:C:944:GLN:HA	1:C:966:GLY:HA2	2.02	0.41
1:C:850:THR:O	1:C:851:ASP:CB	2.68	0.41
1:B:924:ARG:CG	1:B:926:ILE:HG23	2.37	0.41
1:A:1006:TYR:CD1	1:A:1006:TYR:C	2.99	0.41
1:A:754:PHE:CE1	1:A:774:GLY:CA	3.00	0.40
1:B:975:ASP:HB3	1:B:985:TYR:CD2	2.56	0.40
1:C:914:THR:HB	1:C:946:PHE:HB3	2.03	0.40
1:A:994:ASP:HB2	1:A:995:ARG:H	1.66	0.40
1:B:759:GLN:HG2	1:B:769:ASP:CG	2.46	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	239/284 (84%)	221 (92%)	10 (4%)	8 (3%)	3	17
1	B	244/284 (86%)	223 (91%)	15 (6%)	6 (2%)	4	23
1	C	243/284 (86%)	208 (86%)	26 (11%)	9 (4%)	2	15
All	All	726/852 (85%)	652 (90%)	51 (7%)	23 (3%)	3	18

All (23) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	806	PRO
1	A	808	ASP
1	B	850	THR
1	B	979	GLY
1	C	852	GLY
1	C	901	SER
1	C	995	ARG
1	A	979	GLY
1	A	994	ASP
1	B	902	ASN
1	B	910	ALA
1	C	851	ASP
1	A	850	THR
1	A	980	LYS
1	C	829	GLY
1	C	967	ARG
1	B	994	ASP
1	C	806	PRO
1	C	902	ASN
1	C	990	TYR
1	A	931	GLY
1	A	903	GLY
1	B	877	PRO

### 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	176/203 (87%)	132 (75%)	44 (25%)	0	3
1	B	180/203 (89%)	131 (73%)	49 (27%)	0	2
1	C	179/203 (88%)	141 (79%)	38 (21%)	1	6
All	All	535/609 (88%)	404 (76%)	131 (24%)	1	4

All (131) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	760	ILE
1	A	761	SER
1	A	762	ASN
1	A	777	ILE
1	A	784	SER
1	A	796	LEU
1	A	799	THR
1	A	808	ASP
1	A	816	LEU
1	A	833	ASP
1	A	835	VAL
1	A	836	LEU
1	A	838	LEU
1	A	840	ARG
1	A	842	ASP
1	A	843	GLN
1	A	844	GLN
1	A	854	ARG
1	A	856	THR
1	A	858	ASP
1	A	861	THR
1	A	875	GLU
1	A	876	LEU
1	A	885	GLN
1	A	888	VAL
1	A	889	MET
1	A	892	ARG
1	A	893	THR
1	A	898	TYR
1	A	899	ARG
1	A	904	LEU

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Mol	Chain	Res	Type
1	A	905	ARG
1	A	911	ASN
1	A	912	THR
1	A	914	THR
1	A	917	ARG
1	A	935	GLN
1	A	947	LYS
1	A	969	GLU
1	A	974	VAL
1	A	975	ASP
1	A	978	LEU
1	A	996	ILE
1	A	997	ASN
1	B	753	THR
1	B	760	ILE
1	B	763	ARG
1	B	775	LEU
1	B	777	ILE
1	B	779	LEU
1	B	784	SER
1	B	786	SER
1	B	789	ARG
1	B	795	LEU
1	B	796	LEU
1	B	799	THR
1	B	802	ASP
1	B	833	ASP
1	B	835	VAL
1	B	836	LEU
1	B	838	LEU
1	B	843	GLN
1	B	844	GLN
1	B	847	ILE
1	B	850	THR
1	B	855	VAL
1	B	856	THR
1	B	862	SER
1	B	868	LEU
1	B	873	ARG
1	B	885	GLN
1	B	898	TYR
1	B	899	ARG

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Mol	Chain	Res	Type
1	B	904	LEU
1	B	906	VAL
1	B	907	LYS
1	B	908	VAL
1	B	911	ASN
1	B	912	THR
1	B	915	LEU
1	B	924	ARG
1	B	939	ARG
1	B	944	GLN
1	B	945	GLU
1	B	968	VAL
1	B	969	GLU
1	B	974	VAL
1	B	975	ASP
1	B	978	LEU
1	B	980	LYS
1	B	985	TYR
1	B	996	ILE
1	B	1009	SER
1	C	760	ILE
1	C	772	VAL
1	C	776	GLU
1	C	779	LEU
1	C	781	ARG
1	C	789	ARG
1	C	795	LEU
1	C	799	THR
1	C	812	LYS
1	C	825	VAL
1	C	832	LEU
1	C	833	ASP
1	C	838	LEU
1	C	843	GLN
1	C	851	ASP
1	C	855	VAL
1	C	856	THR
1	C	860	ARG
1	C	868	LEU
1	C	874	PHE
1	C	876	LEU
1	C	878	ASN

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Mol	Chain	Res	Type
1	C	879	ASP
1	C	889	MET
1	C	890	LEU
1	C	898	TYR
1	C	902	ASN
1	C	911	ASN
1	C	926	ILE
1	C	928	LEU
1	C	943	THR
1	C	944	GLN
1	C	974	VAL
1	C	978	LEU
1	C	980	LYS
1	C	984	LEU
1	C	996	ILE
1	C	1010	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (23) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	762	ASN
1	A	817	HIS
1	A	843	GLN
1	A	844	GLN
1	A	878	ASN
1	A	911	ASN
1	A	944	GLN
1	A	983	ASN
1	A	1003	HIS
1	B	762	ASN
1	B	817	HIS
1	B	932	ASN
1	B	983	ASN
1	C	758	GLN
1	C	762	ASN
1	C	770	GLN
1	C	846	ASN
1	C	878	ASN
1	C	885	GLN
1	C	902	ASN
1	C	911	ASN
1	C	944	GLN

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Mol	Chain	Res	Type
1	C	982	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](#)

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 [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q < 0.9
1	A	245/284 (86%)	-0.15	0	100   100	54, 77, 109, 133	0
1	B	250/284 (88%)	-0.13	2 (0%)	82   64	58, 81, 118, 160	0
1	C	249/284 (87%)	0.27	4 (1%)	70   47	88, 114, 136, 157	0
All	All	744/852 (87%)	-0.00	6 (0%)	82   64	54, 90, 131, 160	0

All (6) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	848	ALA	3.5
1	B	949	THR	3.2
1	C	767	ALA	2.6
1	C	977	ALA	2.2
1	B	853	GLY	2.2
1	C	888	VAL	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.