



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 12, 2024 – 09:47 am BST

PDB ID : 8QQH
Title : Structure of beta-galactosidase from *Desulfurococcus amylophilus*
Authors : Samygina, V.R.; Kil, Y.; Sergeev, R.S.; Rychkov, G.N.
Deposited on : 2023-10-04
Resolution : 2.15 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 : 4.02b-467
Xtriage (Phenix) : 1.13
EDS : 2.37.1
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.37.1

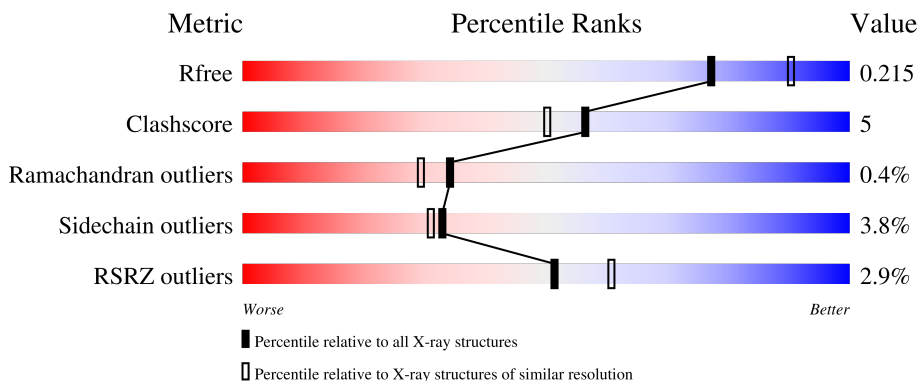
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION


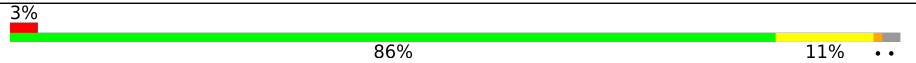
The reported resolution of this entry is 2.15 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1479 (2.16-2.16)
Clashscore	141614	1585 (2.16-2.16)
Ramachandran outliers	138981	1560 (2.16-2.16)
Sidechain outliers	138945	1559 (2.16-2.16)
RSRZ outliers	127900	1456 (2.16-2.16)

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	AAA	988	 2% 83% 15% ..
1	BBB	988	 3% 86% 11% ..

2 Entry composition i

There are 2 unique types of molecules in this entry. The entry contains 16160 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 Beta-galactosidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	AAA	971	7863	5071	1324	1446	22	0	0	0
1	BBB	969	7846	5065	1319	1440	22	0	0	0

There are 38 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
AAA	43	ASP	GLY	conflict	UNP B8D3P7
AAA	50	ASN	ASP	conflict	UNP B8D3P7
AAA	513	GLU	GLY	conflict	UNP B8D3P7
AAA	629	LYS	ARG	conflict	UNP B8D3P7
AAA	716	PRO	SER	conflict	UNP B8D3P7
AAA	751	ASP	GLY	conflict	UNP B8D3P7
AAA	976	LYS	-	expression tag	UNP B8D3P7
AAA	977	LEU	-	expression tag	UNP B8D3P7
AAA	978	ALA	-	expression tag	UNP B8D3P7
AAA	979	ALA	-	expression tag	UNP B8D3P7
AAA	980	ALA	-	expression tag	UNP B8D3P7
AAA	981	LEU	-	expression tag	UNP B8D3P7
AAA	982	GLU	-	expression tag	UNP B8D3P7
AAA	983	HIS	-	expression tag	UNP B8D3P7
AAA	984	HIS	-	expression tag	UNP B8D3P7
AAA	985	HIS	-	expression tag	UNP B8D3P7
AAA	986	HIS	-	expression tag	UNP B8D3P7
AAA	987	HIS	-	expression tag	UNP B8D3P7
AAA	988	HIS	-	expression tag	UNP B8D3P7
BBB	43	ASP	GLY	conflict	UNP B8D3P7
BBB	50	ASN	ASP	conflict	UNP B8D3P7
BBB	513	GLU	GLY	conflict	UNP B8D3P7
BBB	629	LYS	ARG	conflict	UNP B8D3P7
BBB	716	PRO	SER	conflict	UNP B8D3P7
BBB	751	ASP	GLY	conflict	UNP B8D3P7

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Chain	Residue	Modelled	Actual	Comment	Reference
BBB	976	LYS	-	expression tag	UNP B8D3P7
BBB	977	LEU	-	expression tag	UNP B8D3P7
BBB	978	ALA	-	expression tag	UNP B8D3P7
BBB	979	ALA	-	expression tag	UNP B8D3P7
BBB	980	ALA	-	expression tag	UNP B8D3P7
BBB	981	LEU	-	expression tag	UNP B8D3P7
BBB	982	GLU	-	expression tag	UNP B8D3P7
BBB	983	HIS	-	expression tag	UNP B8D3P7
BBB	984	HIS	-	expression tag	UNP B8D3P7
BBB	985	HIS	-	expression tag	UNP B8D3P7
BBB	986	HIS	-	expression tag	UNP B8D3P7
BBB	987	HIS	-	expression tag	UNP B8D3P7
BBB	988	HIS	-	expression tag	UNP B8D3P7

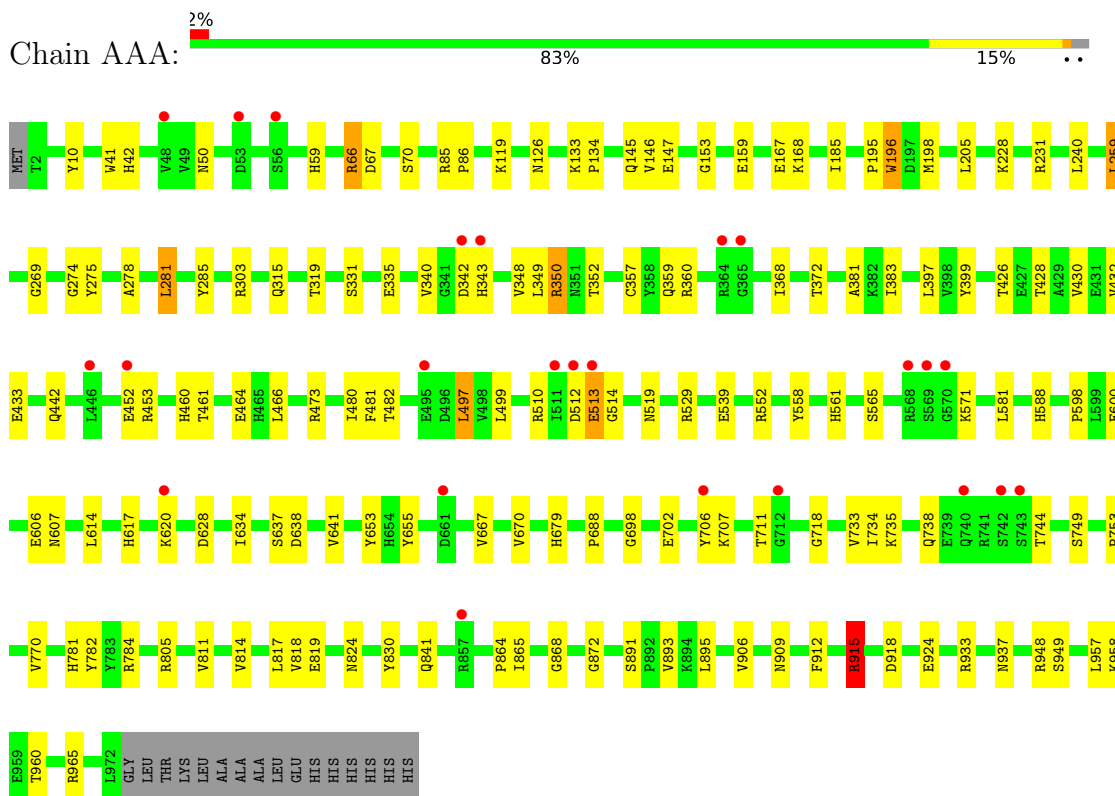
- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	AAA	257	Total O 257 257	0	0
2	BBB	194	Total O 194 194	0	0

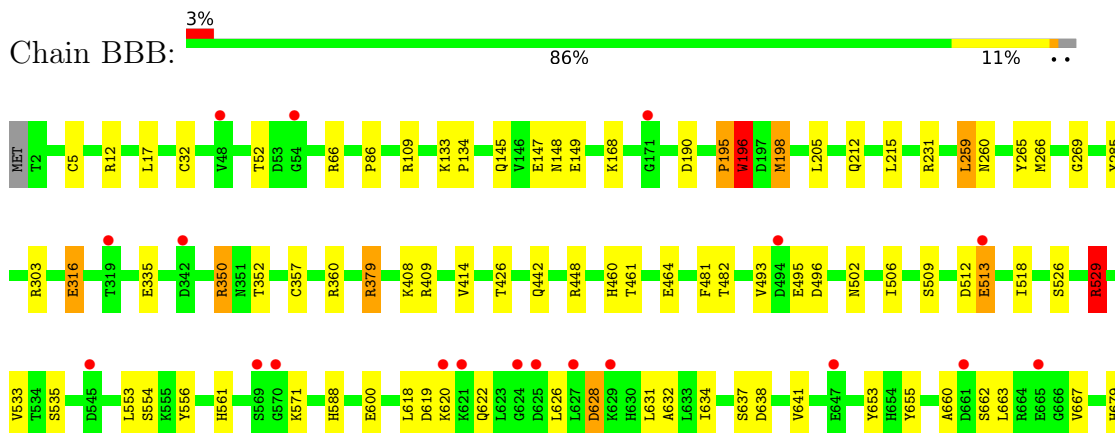
3 Residue-property plots i

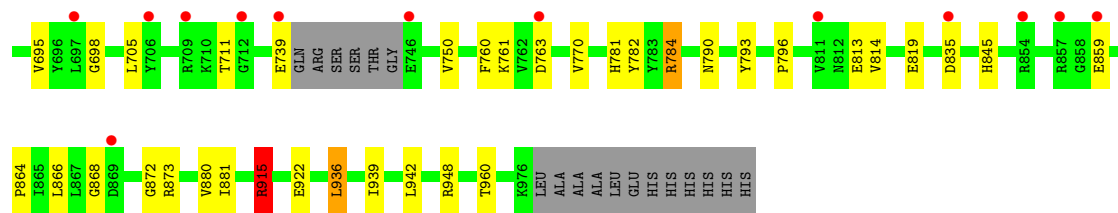
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: Beta-galactosidase



- Molecule 1: Beta-galactosidase





4 Data and refinement statistics

Property	Value	Source
Space group	P 2 21 21	Depositor
Cell constants a, b, c, α , β , γ	81.23Å 140.76Å 207.77Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	15.00 – 2.15 14.99 – 2.15	Depositor EDS
% Data completeness (in resolution range)	98.4 (15.00-2.15) 98.7 (14.99-2.15)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.15 (at 2.16Å)	Xtrriage
Refinement program	REFMAC 5.8.0258	Depositor
R, R_{free}	0.165 , 0.211 0.175 , 0.215	Depositor DCC
R_{free} test set	6351 reflections (4.96%)	wwPDB-VP
Wilson B-factor (Å ²)	39.0	Xtrriage
Anisotropy	0.023	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 41.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	16160	wwPDB-VP
Average B, all atoms (Å ²)	44.0	wwPDB-VP

Xtrriage'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	AAA	0.72	0/8067	0.92	11/10968 (0.1%)
1	BBB	0.73	0/8049	0.92	11/10942 (0.1%)
All	All	0.72	0/16116	0.92	22/21910 (0.1%)

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	AAA	0	1
1	BBB	0	1
All	All	0	2

There are no bond length outliers.

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	BBB	12	ARG	NE-CZ-NH2	-12.40	114.10	120.30
1	BBB	12	ARG	NE-CZ-NH1	11.11	125.86	120.30
1	AAA	915	ARG	NE-CZ-NH2	-10.99	114.81	120.30
1	BBB	350	ARG	NE-CZ-NH2	-9.32	115.64	120.30
1	AAA	350	ARG	NE-CZ-NH2	-9.11	115.75	120.30
1	BBB	303	ARG	NE-CZ-NH2	-7.58	116.51	120.30
1	AAA	66	ARG	NE-CZ-NH2	-7.40	116.60	120.30
1	BBB	350	ARG	NE-CZ-NH1	7.32	123.96	120.30
1	AAA	350	ARG	NE-CZ-NH1	6.88	123.74	120.30
1	AAA	66	ARG	CG-CD-NE	-6.87	97.37	111.80
1	AAA	303	ARG	NE-CZ-NH2	-6.72	116.94	120.30
1	AAA	66	ARG	NE-CZ-NH1	6.66	123.63	120.30
1	AAA	915	ARG	NE-CZ-NH1	6.63	123.62	120.30
1	BBB	303	ARG	NE-CZ-NH1	6.08	123.34	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	BBB	195	PRO	C-N-CA	6.04	136.79	121.70
1	BBB	198	MET	CG-SD-CE	5.93	109.69	100.20
1	AAA	706	TYR	CB-CA-C	-5.92	98.56	110.40
1	AAA	85	ARG	NE-CZ-NH2	-5.86	117.37	120.30
1	BBB	915	ARG	NE-CZ-NH1	-5.75	117.42	120.30
1	BBB	196	TRP	N-CA-CB	5.71	120.88	110.60
1	AAA	228	LYS	CB-CA-C	-5.61	99.17	110.40
1	BBB	529	ARG	CB-CA-C	5.49	121.39	110.40

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	AAA	195	PRO	Peptide
1	BBB	195	PRO	Peptide

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	AAA	7863	0	7788	89	0
1	BBB	7846	0	7775	74	0
2	AAA	257	0	0	10	0
2	BBB	194	0	0	5	0
All	All	16160	0	15563	157	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 5.

All (157) 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:BBB:619:ASP:H	1:BBB:622:GLN:HE21	1.25	0.84
1:AAA:634:ILE:HG21	1:AAA:770:VAL:HG11	1.59	0.82
1:AAA:933:ARG:H	1:AAA:937:ASN:HD21	1.29	0.81

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:BBB:641:VAL:HG11	1:BBB:872:GLY:HA2	1.67	0.76
1:AAA:278:ALA:HB3	1:AAA:281:LEU:HD13	1.66	0.76
1:BBB:634:ILE:HG21	1:BBB:770:VAL:HG11	1.68	0.76
1:AAA:331:SER:H	1:AAA:359:GLN:HE22	1.33	0.73
1:BBB:205:LEU:HD22	1:BBB:259:LEU:CD1	2.20	0.72
1:BBB:588:HIS:HD2	1:BBB:845:HIS:ND1	1.90	0.70
1:BBB:641:VAL:CG1	1:BBB:872:GLY:HA2	2.22	0.69
1:BBB:408:LYS:HE3	1:BBB:495:GLU:OE2	1.92	0.69
1:AAA:924:GLU:OE2	1:AAA:958:LYS:NZ	2.22	0.69
1:AAA:510:ARG:HD3	2:AAA:1239:HOH:O	1.94	0.67
1:AAA:41:TRP:NE1	1:AAA:66:ARG:HD3	2.10	0.66
1:AAA:368:ILE:HD12	1:AAA:399:TYR:CE2	2.31	0.65
1:BBB:760:PHE:HE1	1:BBB:814:VAL:HG23	1.61	0.65
1:BBB:790:ASN:ND2	1:BBB:813:GLU:H	1.94	0.65
1:BBB:145:GLN:HE22	1:BBB:148:ASN:HD22	1.44	0.65
1:BBB:495:GLU:C	1:BBB:495:GLU:OE1	2.34	0.65
1:AAA:10:TYR:OH	1:AAA:42:HIS:HE1	1.80	0.65
1:AAA:600:GLU:OE2	1:AAA:679:HIS:HE1	1.79	0.65
1:AAA:497:LEU:HD22	1:AAA:499:LEU:HD11	1.80	0.63
1:AAA:231:ARG:HD3	1:AAA:653:TYR:CE2	2.33	0.63
1:AAA:588:HIS:H	1:AAA:841:GLN:HE22	1.47	0.63
1:BBB:631:LEU:HD21	1:BBB:695:VAL:HG13	1.79	0.62
1:BBB:784:ARG:HD2	1:BBB:819:GLU:OE1	1.99	0.62
1:AAA:915:ARG:HD2	2:AAA:1050:HOH:O	1.99	0.62
1:AAA:513:GLU:HG2	1:AAA:514:GLY:H	1.65	0.61
1:BBB:631:LEU:HD23	1:BBB:632:ALA:N	2.15	0.61
1:AAA:460:HIS:HD2	1:AAA:482:THR:O	1.83	0.60
1:BBB:426:THR:OG1	1:BBB:460:HIS:HE1	1.85	0.60
1:BBB:17:LEU:HD21	2:BBB:1017:HOH:O	2.02	0.59
1:AAA:598:PRO:HB3	1:AAA:688:PRO:HB3	1.84	0.59
1:AAA:805:ARG:HG2	2:AAA:1206:HOH:O	2.02	0.59
1:BBB:231:ARG:HD3	1:BBB:653:TYR:CZ	2.37	0.59
1:BBB:506:ILE:HG23	1:BBB:518:ILE:CG2	2.33	0.59
1:AAA:359:GLN:HE21	1:AAA:360:ARG:H	1.52	0.58
1:AAA:231:ARG:HD2	2:AAA:1220:HOH:O	2.04	0.58
1:AAA:497:LEU:HD22	1:AAA:499:LEU:CD1	2.34	0.57
1:BBB:496:ASP:OD2	1:BBB:535:SER:OG	2.21	0.57
1:AAA:744:THR:HG22	2:AAA:1237:HOH:O	2.04	0.57
1:BBB:442:GLN:NE2	1:BBB:553:LEU:O	2.38	0.56
1:BBB:86:PRO:HD2	1:BBB:145:GLN:O	2.05	0.56
1:BBB:619:ASP:N	1:BBB:622:GLN:HE21	1.98	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:AAA:42:HIS:HD2	1:AAA:50:ASN:O	1.90	0.54
1:AAA:340:VAL:CG1	2:AAA:1003:HOH:O	2.54	0.54
1:BBB:915:ARG:HD2	2:BBB:1110:HOH:O	2.07	0.54
1:AAA:59:HIS:HE1	1:AAA:606:GLU:OE1	1.90	0.54
1:AAA:278:ALA:HB3	1:AAA:281:LEU:CD1	2.37	0.54
1:BBB:335:GLU:OE1	1:BBB:350:ARG:HD2	2.08	0.54
1:AAA:426:THR:OG1	1:AAA:460:HIS:HE1	1.90	0.53
1:BBB:760:PHE:CE1	1:BBB:814:VAL:HG23	2.43	0.53
1:BBB:529:ARG:HD2	2:BBB:1022:HOH:O	2.08	0.53
1:AAA:864:PRO:HD3	1:BBB:561:HIS:CE1	2.44	0.53
1:AAA:59:HIS:CD2	1:AAA:275:TYR:H	2.26	0.53
1:AAA:581:LEU:HD21	1:AAA:865:ILE:HD13	1.89	0.53
1:BBB:495:GLU:OE1	1:BBB:496:ASP:N	2.41	0.53
1:AAA:784:ARG:NH2	2:AAA:1007:HOH:O	2.35	0.52
1:BBB:231:ARG:HD2	2:BBB:1152:HOH:O	2.09	0.51
1:AAA:159:GLU:HA	1:AAA:185:ILE:HD11	1.91	0.51
1:BBB:133:LYS:HB3	1:BBB:134:PRO:HD3	1.93	0.51
1:BBB:196:TRP:HA	1:BBB:196:TRP:CE3	2.46	0.51
1:AAA:231:ARG:HD3	1:AAA:653:TYR:CZ	2.46	0.51
1:AAA:600:GLU:OE2	1:AAA:679:HIS:CE1	2.61	0.51
1:AAA:205:LEU:HD22	1:AAA:259:LEU:CD1	2.41	0.51
1:BBB:790:ASN:HD21	1:BBB:813:GLU:H	1.59	0.50
1:AAA:519:ASN:HB3	1:AAA:965:ARG:HH12	1.77	0.50
1:AAA:824:ASN:HD22	1:BBB:360:ARG:NH2	2.10	0.50
1:AAA:909:ASN:HD21	1:AAA:937:ASN:HD22	1.59	0.50
1:AAA:41:TRP:O	1:AAA:66:ARG:HD2	2.13	0.49
1:BBB:493:VAL:HG11	1:BBB:518:ILE:HD12	1.95	0.49
1:AAA:133:LYS:HB3	1:AAA:134:PRO:HD3	1.94	0.49
1:AAA:335:GLU:OE1	1:AAA:350:ARG:HD2	2.12	0.49
1:BBB:198:MET:HG2	1:BBB:352:THR:HG21	1.95	0.49
1:BBB:205:LEU:HD22	1:BBB:259:LEU:HD13	1.95	0.48
1:AAA:588:HIS:H	1:AAA:841:GLN:NE2	2.11	0.48
1:BBB:660:ALA:HB1	1:BBB:663:LEU:HD12	1.96	0.48
1:AAA:733:VAL:HG21	1:AAA:817:LEU:HD22	1.94	0.48
1:AAA:41:TRP:CD1	1:AAA:66:ARG:HD3	2.49	0.47
1:BBB:212:GLN:HB3	1:BBB:215:LEU:HD12	1.97	0.47
1:AAA:198:MET:HG2	1:AAA:352:THR:HG21	1.97	0.47
1:AAA:499:LEU:HD12	1:AAA:499:LEU:N	2.28	0.47
1:BBB:493:VAL:HG11	1:BBB:518:ILE:CD1	2.45	0.47
1:AAA:893:VAL:HB	1:AAA:957:LEU:HD22	1.97	0.46
1:BBB:781:HIS:HE1	2:BBB:1132:HOH:O	1.99	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:BBB:880:VAL:CG1	1:BBB:936:LEU:HG	2.44	0.46
1:AAA:918:ASP:HB3	1:BBB:461:THR:HG22	1.97	0.46
1:AAA:641:VAL:HG12	1:AAA:872:GLY:HA2	1.98	0.46
1:BBB:631:LEU:HD21	1:BBB:695:VAL:CG1	2.46	0.46
1:AAA:781:HIS:HE1	2:AAA:1132:HOH:O	1.99	0.45
1:AAA:275:TYR:HB3	1:AAA:607:ASN:HB2	1.98	0.45
1:BBB:571:LYS:HE2	1:BBB:960:THR:O	2.15	0.45
1:AAA:41:TRP:CE2	1:AAA:66:ARG:HD3	2.51	0.45
1:AAA:460:HIS:CD2	1:AAA:482:THR:O	2.68	0.45
1:AAA:895:LEU:HD23	1:AAA:906:VAL:HG11	1.99	0.45
1:BBB:460:HIS:HD2	1:BBB:482:THR:O	2.00	0.45
1:AAA:42:HIS:CD2	1:AAA:66:ARG:HB3	2.52	0.45
1:BBB:464:GLU:HA	1:BBB:481:PHE:O	2.17	0.45
1:BBB:52:THR:O	1:BBB:66:ARG:HB2	2.17	0.45
1:BBB:149:GLU:OE1	1:BBB:190:ASP:OD2	2.35	0.44
1:AAA:868:GLY:HA3	1:AAA:948:ARG:O	2.18	0.44
1:AAA:588:HIS:N	1:AAA:841:GLN:HE22	2.13	0.44
1:AAA:960:THR:HG22	2:AAA:1095:HOH:O	2.18	0.44
1:AAA:198:MET:HG3	1:AAA:350:ARG:CZ	2.47	0.44
1:AAA:205:LEU:HD22	1:AAA:259:LEU:HD12	1.99	0.44
1:AAA:784:ARG:HD2	1:AAA:819:GLU:OE2	2.18	0.44
1:BBB:793:TYR:OH	1:BBB:796:PRO:HD3	2.18	0.44
1:BBB:942:LEU:C	1:BBB:942:LEU:HD23	2.39	0.44
1:BBB:269:GLY:HA3	1:BBB:285:TYR:O	2.19	0.43
1:AAA:240:LEU:HD12	1:BBB:379:ARG:HG3	2.00	0.43
1:AAA:497:LEU:CD2	1:AAA:499:LEU:HD11	2.47	0.43
1:AAA:617:HIS:CE1	1:AAA:667:VAL:HG12	2.54	0.43
1:BBB:626:LEU:HD22	1:BBB:628:ASP:O	2.19	0.43
1:AAA:126:ASN:OD1	1:AAA:168:LYS:NZ	2.50	0.43
1:BBB:600:GLU:OE2	1:BBB:679:HIS:HE1	2.01	0.43
1:AAA:269:GLY:HA3	1:AAA:285:TYR:O	2.19	0.43
1:BBB:571:LYS:CE	1:BBB:960:THR:O	2.67	0.43
1:AAA:960:THR:CG2	2:AAA:1095:HOH:O	2.66	0.43
1:AAA:196:TRP:HA	1:AAA:196:TRP:CE3	2.53	0.43
1:AAA:466:LEU:HD22	1:AAA:480:ILE:HG12	2.01	0.43
1:AAA:561:HIS:CE1	1:BBB:864:PRO:HD3	2.54	0.42
1:AAA:349:LEU:O	1:AAA:381:ALA:HA	2.20	0.42
1:BBB:618:LEU:HA	1:BBB:622:GLN:NE2	2.34	0.42
1:BBB:637:SER:HA	1:BBB:638:ASP:HA	1.77	0.42
1:AAA:205:LEU:HD23	1:AAA:205:LEU:HA	1.81	0.42
1:AAA:909:ASN:HD21	1:AAA:937:ASN:ND2	2.18	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:BBB:231:ARG:HD3	1:BBB:653:TYR:CE2	2.55	0.42
1:AAA:614:LEU:HB2	1:AAA:670:VAL:HB	2.02	0.42
1:BBB:868:GLY:HA3	1:BBB:948:ARG:O	2.20	0.42
1:AAA:464:GLU:HA	1:AAA:481:PHE:O	2.20	0.42
1:BBB:533:VAL:HA	1:BBB:556:TYR:O	2.20	0.42
1:BBB:493:VAL:HG13	1:BBB:509:SER:HB3	2.01	0.41
1:AAA:734:ILE:O	1:AAA:738:GLN:HG2	2.19	0.41
1:AAA:432:VAL:O	1:AAA:452:GLU:HB3	2.21	0.41
1:BBB:196:TRP:CH2	1:BBB:379:ARG:HD2	2.55	0.41
1:BBB:881:ILE:HD12	1:BBB:939:ILE:HG13	2.03	0.41
1:AAA:67:ASP:OD2	1:AAA:70:SER:OG	2.36	0.41
1:AAA:348:VAL:HG22	1:AAA:383:ILE:HG12	2.03	0.41
1:AAA:430:VAL:O	1:AAA:453:ARG:HA	2.21	0.41
1:BBB:5:CYS:HA	1:BBB:32:CYS:O	2.21	0.41
1:BBB:493:VAL:HG13	1:BBB:509:SER:CB	2.51	0.41
1:AAA:274:GLY:HA2	1:AAA:912:PHE:CE2	2.55	0.41
1:AAA:824:ASN:ND2	1:BBB:360:ARG:NH2	2.68	0.41
1:AAA:552:ARG:HD3	1:AAA:558:TYR:CE2	2.56	0.41
1:AAA:698:GLY:O	1:AAA:830:TYR:HA	2.19	0.41
1:AAA:753:PRO:HA	1:AAA:818:VAL:O	2.21	0.41
1:BBB:409:ARG:HD3	1:BBB:414:VAL:HG22	2.03	0.41
1:BBB:588:HIS:CD2	1:BBB:845:HIS:ND1	2.80	0.41
1:AAA:397:LEU:HD11	1:AAA:428:THR:HG23	2.03	0.40
1:AAA:153:GLY:HA3	1:AAA:718:GLY:O	2.21	0.40
1:BBB:502:ASN:O	1:BBB:526:SER:HA	2.21	0.40
1:AAA:86:PRO:HD2	1:AAA:145:GLN:O	2.21	0.40
1:BBB:265:TYR:HA	1:BBB:266:MET:HA	1.94	0.40
1:BBB:512:ASP:O	1:BBB:513:GLU:C	2.59	0.40
1:AAA:637:SER:HA	1:AAA:638:ASP:HA	1.87	0.40
1:BBB:145:GLN:NE2	1:BBB:148:ASN:HD22	2.13	0.40
1:BBB:641:VAL:HG12	1:BBB:872:GLY:HA2	2.01	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	AAA	969/988 (98%)	927 (96%)	38 (4%)	4 (0%)	34	29
1	BBB	965/988 (98%)	921 (95%)	40 (4%)	4 (0%)	34	29
All	All	1934/1976 (98%)	1848 (96%)	78 (4%)	8 (0%)	34	29

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	AAA	512	ASP
1	BBB	513	GLU
1	AAA	196	TRP
1	BBB	196	TRP
1	AAA	571	LYS
1	AAA	473	ARG
1	BBB	316	GLU
1	BBB	698	GLY

5.3.2 Protein sidechains [i](#)

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	AAA	856/869 (98%)	822 (96%)	34 (4%)	31	29
1	BBB	853/869 (98%)	822 (96%)	31 (4%)	35	33
All	All	1709/1738 (98%)	1644 (96%)	65 (4%)	33	31

All (65) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	AAA	119	LYS
1	AAA	146	VAL
1	AAA	147	GLU
1	AAA	167	GLU
1	AAA	259	LEU

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Mol	Chain	Res	Type
1	AAA	281	LEU
1	AAA	315	GLN
1	AAA	319	THR
1	AAA	342	ASP
1	AAA	343	HIS
1	AAA	357	CYS
1	AAA	372	THR
1	AAA	433	GLU
1	AAA	442	GLN
1	AAA	461	THR
1	AAA	497	LEU
1	AAA	513	GLU
1	AAA	529	ARG
1	AAA	539	GLU
1	AAA	565	SER
1	AAA	620	LYS
1	AAA	628	ASP
1	AAA	655	TYR
1	AAA	702	GLU
1	AAA	707	LYS
1	AAA	711	THR
1	AAA	735	LYS
1	AAA	749	SER
1	AAA	782	TYR
1	AAA	811	VAL
1	AAA	814	VAL
1	AAA	891	SER
1	AAA	915	ARG
1	AAA	949	SER
1	BBB	109	ARG
1	BBB	147	GLU
1	BBB	168	LYS
1	BBB	259	LEU
1	BBB	260	ASN
1	BBB	316	GLU
1	BBB	357	CYS
1	BBB	379	ARG
1	BBB	448	ARG
1	BBB	529	ARG
1	BBB	554	SER
1	BBB	620	LYS
1	BBB	628	ASP

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Mol	Chain	Res	Type
1	BBB	655	TYR
1	BBB	662	SER
1	BBB	667	VAL
1	BBB	705	LEU
1	BBB	711	THR
1	BBB	739	GLU
1	BBB	750	VAL
1	BBB	761	LYS
1	BBB	763	ASP
1	BBB	782	TYR
1	BBB	784	ARG
1	BBB	835	ASP
1	BBB	859	GLU
1	BBB	866	LEU
1	BBB	873	ARG
1	BBB	915	ARG
1	BBB	922	GLU
1	BBB	936	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 monosaccharides 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	AAA	971/988 (98%)	-0.21	24 (2%) 57 65	25, 39, 70, 111	0
1	BBB	969/988 (98%)	-0.14	32 (3%) 46 55	26, 42, 79, 110	0
All	All	1940/1976 (98%)	-0.17	56 (2%) 51 61	25, 41, 74, 111	0

All (56) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	AAA	513	GLU	5.2
1	AAA	742	SER	4.9
1	AAA	712	GLY	4.7
1	BBB	545	ASP	4.6
1	BBB	712	GLY	4.4
1	AAA	743	SER	4.2
1	AAA	740	GLN	4.0
1	BBB	621	LYS	4.0
1	BBB	494	ASP	3.7
1	AAA	570	GLY	3.6
1	AAA	343	HIS	3.5
1	AAA	512	ASP	3.4
1	BBB	763	ASP	3.4
1	BBB	869	ASP	3.4
1	BBB	706	TYR	3.3
1	BBB	624	GLY	3.3
1	BBB	647	GLU	3.1
1	BBB	857	ARG	3.0
1	BBB	811	VAL	3.0
1	AAA	568	ARG	2.9
1	BBB	746	GLU	2.9
1	BBB	570	GLY	2.8
1	AAA	53	ASP	2.8
1	BBB	661	ASP	2.8

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Mol	Chain	Res	Type	RSRZ
1	BBB	665	GLU	2.7
1	BBB	620	LYS	2.7
1	BBB	342	ASP	2.6
1	BBB	625	ASP	2.6
1	BBB	513	GLU	2.6
1	AAA	342	ASP	2.6
1	BBB	854	ARG	2.5
1	AAA	48	VAL	2.5
1	AAA	56	SER	2.5
1	AAA	569	SER	2.5
1	BBB	859	GLU	2.5
1	BBB	627	LEU	2.5
1	BBB	569	SER	2.5
1	AAA	452	GLU	2.5
1	BBB	171	GLY	2.4
1	AAA	706	TYR	2.4
1	AAA	365	GLY	2.4
1	BBB	54	GLY	2.4
1	BBB	629	LYS	2.4
1	BBB	48	VAL	2.3
1	AAA	857	ARG	2.3
1	AAA	511	ILE	2.3
1	BBB	709	ARG	2.3
1	BBB	739	GLU	2.3
1	AAA	364	ARG	2.3
1	AAA	446	LEU	2.2
1	BBB	697	LEU	2.2
1	AAA	495	GLU	2.2
1	AAA	661	ASP	2.2
1	BBB	835	ASP	2.1
1	BBB	319	THR	2.1
1	AAA	620	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 monosaccharides 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.