



Full wwPDB X-ray Structure Validation Report ⓘ

Nov 10, 2022 – 02:03 PM EST

PDB ID : 8EWH
Title : Salmonella typhimurium GTPase BIPA
Authors : Brown, R.S.; deLivron, M.A.; Robinson, V.L.
Deposited on : 2022-10-23
Resolution : 2.33 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 : 2.31.2
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) : 2.31.2

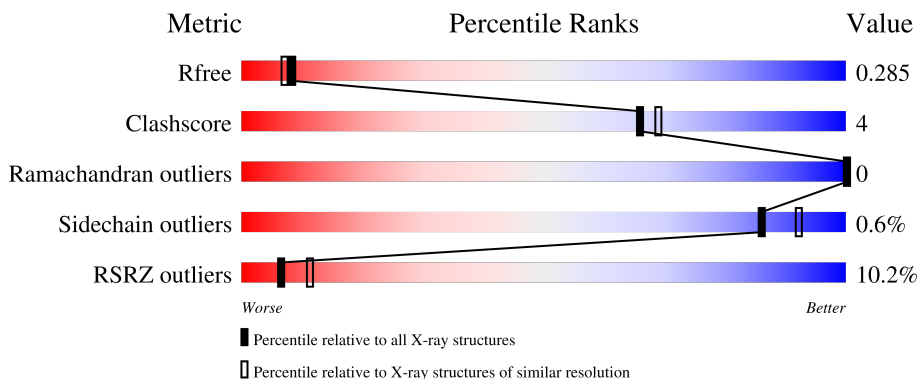
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.33 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	2096 (2.36-2.32)
Clashscore	141614	2193 (2.36-2.32)
Ramachandran outliers	138981	2159 (2.36-2.32)
Sidechain outliers	138945	2160 (2.36-2.32)
RSRZ outliers	127900	2067 (2.36-2.32)

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	607	
1	B	607	

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 9158 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 50S ribosomal subunit assembly factor BipA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	581	4522	2831	801	873	17	0	0	0
1	B	581	4522	2831	801	873	17	0	0	0

- Molecule 2 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	2	Total	Na	0	0
			2	2		
2	B	2	Total	Na	0	0
			2	2		

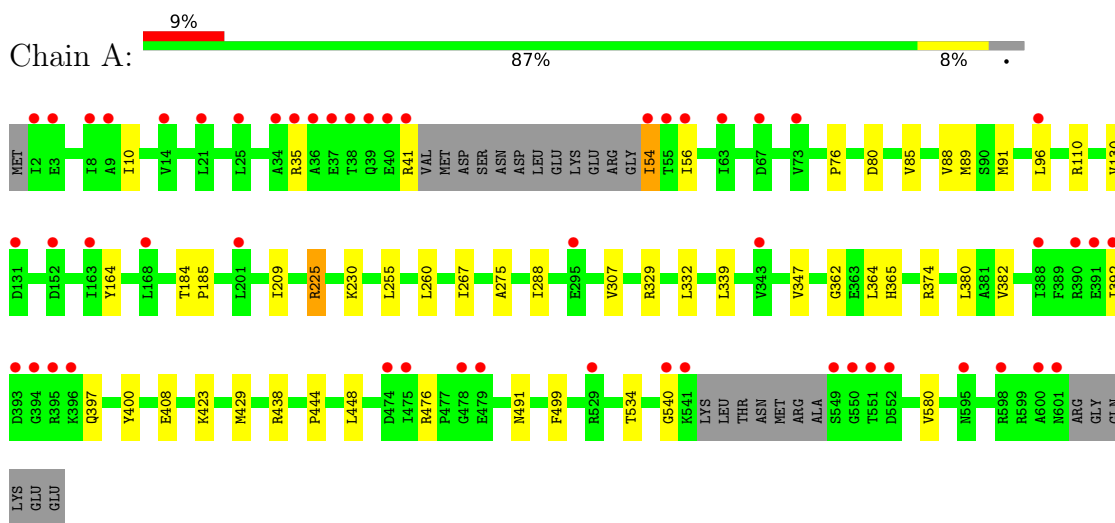
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	70	Total	O	0	0
			70	70		
3	B	40	Total	O	0	0
			40	40		

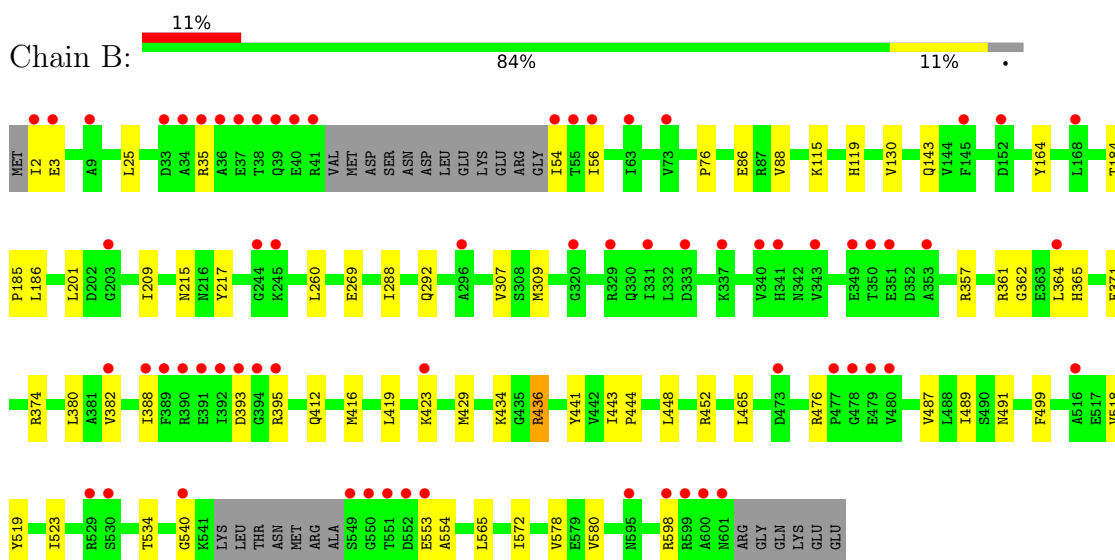
3 Residue-property plots

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: 50S ribosomal subunit assembly factor BipA



- Molecule 1: 50S ribosomal subunit assembly factor BipA



4 Data and refinement statistics i

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	89.41Å 83.70Å 95.41Å 90.00° 105.77° 90.00°	Depositor
Resolution (Å)	29.78 – 2.33 29.78 – 2.33	Depositor EDS
% Data completeness (in resolution range)	90.6 (29.78-2.33) 90.7 (29.78-2.33)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	0.09	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.54 (at 2.34Å)	Xtrriage
Refinement program	REFMAC v5.8.0267	Depositor
R, R_{free}	0.231 , 0.283 0.234 , 0.285	Depositor DCC
R_{free} test set	2551 reflections (4.84%)	wwPDB-VP
Wilson B-factor (Å ²)	30.0	Xtrriage
Anisotropy	0.030	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 40.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	9158	wwPDB-VP
Average B, all atoms (Å ²)	36.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 20.69 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 8.2334e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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: 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	0.84	1/4593 (0.0%)	0.84	0/6213
1	B	0.82	0/4593	0.84	1/6213 (0.0%)
All	All	0.83	1/9186 (0.0%)	0.84	1/12426 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	408	GLU	CD-OE1	5.39	1.31	1.25

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	436	ARG	NE-CZ-NH2	-5.30	117.65	120.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4522	0	4514	31	0
1	B	4522	0	4514	42	0
2	A	2	0	0	0	0
2	B	2	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	A	70	0	0	0	0
3	B	40	0	0	0	0
All	All	9158	0	9028	72	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 4.

All (72) 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:423:LYS:HB3	1:A:476:ARG:HD3	1.77	0.65
1:A:80:ASP:OD2	1:A:364:LEU:HD21	1.97	0.65
1:B:35:ARG:HD3	1:B:260:LEU:HD22	1.79	0.65
1:A:380:LEU:HD13	1:A:382:VAL:HG13	1.80	0.63
1:A:91:MET:HG3	1:A:225:ARG:HB2	1.83	0.60
1:A:91:MET:CG	1:A:225:ARG:HB2	2.32	0.59
1:B:553:GLU:HG3	1:B:554:ALA:H	1.67	0.58
1:B:412:GLN:O	1:B:416:MET:HG3	2.02	0.58
1:B:491:ASN:HB3	1:B:534:THR:HG22	1.85	0.58
1:B:393:ASP:O	1:B:395:ARG:HG2	2.06	0.56
1:A:491:ASN:HB3	1:A:534:THR:HG22	1.87	0.56
1:B:553:GLU:HG3	1:B:554:ALA:N	2.21	0.56
1:A:329:ARG:NH1	1:A:332:LEU:HD23	2.21	0.55
1:A:429:MET:HE1	1:B:429:MET:SD	2.48	0.54
1:B:54:ILE:HG13	1:B:56:ILE:HG12	1.89	0.53
1:A:380:LEU:CD1	1:A:382:VAL:HG13	2.37	0.53
1:B:292:GLN:O	1:B:292:GLN:HG3	2.08	0.53
1:B:184:THR:HB	1:B:185:PRO:HD3	1.89	0.53
1:B:86:GLU:HG2	1:B:119:HIS:NE2	2.24	0.52
1:B:25:LEU:HD21	1:B:186:LEU:HD23	1.92	0.51
1:B:419:LEU:HD13	1:B:441:TYR:CD1	2.45	0.51
1:A:499:PHE:HD2	1:A:540:GLY:HA3	1.74	0.51
1:B:423:LYS:HB3	1:B:476:ARG:HD3	1.92	0.51
1:A:380:LEU:HD12	1:A:380:LEU:C	2.31	0.50
1:B:54:ILE:CG1	1:B:56:ILE:HG12	2.42	0.50
1:A:35:ARG:CZ	1:A:260:LEU:HD22	2.41	0.50
1:B:380:LEU:CD1	1:B:382:VAL:HG13	2.42	0.49
1:A:230:LYS:HD2	1:A:267:ILE:HD11	1.96	0.48
1:A:110:ARG:HD2	1:A:438:ARG:CZ	2.44	0.48
1:B:487:VAL:HG21	1:B:523:ILE:HD12	1.96	0.48
1:A:130:VAL:HG11	1:A:164:TYR:HB3	1.96	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:518:VAL:HG12	1:B:519:TYR:N	2.29	0.47
1:A:423:LYS:HB3	1:A:476:ARG:CD	2.45	0.47
1:B:201:LEU:CD1	1:B:269:GLU:HB3	2.45	0.47
1:A:184:THR:HB	1:A:185:PRO:HD3	1.97	0.46
1:B:76:PRO:HD3	1:B:88:VAL:HG21	1.97	0.46
1:B:419:LEU:HD13	1:B:441:TYR:CE1	2.51	0.46
1:A:54:ILE:HG23	1:A:56:ILE:HG12	1.98	0.46
1:A:307:VAL:HG11	1:A:362:GLY:C	2.36	0.46
1:B:130:VAL:HG11	1:B:164:TYR:HB3	1.97	0.46
1:B:307:VAL:HG11	1:B:362:GLY:C	2.36	0.45
1:B:2:ILE:HG23	1:B:3:GLU:OE1	2.17	0.45
1:B:452:ARG:NH1	1:B:465:LEU:HB3	2.32	0.45
1:B:380:LEU:HD13	1:B:382:VAL:HG13	1.98	0.45
1:A:339:LEU:HD13	1:A:347:VAL:HG23	1.98	0.45
1:B:215:ASN:OD1	1:B:217:TYR:HB2	2.17	0.45
1:B:572:ILE:HD13	1:B:578:VAL:HG23	1.98	0.45
1:B:380:LEU:C	1:B:380:LEU:HD12	2.38	0.44
1:A:400:TYR:HA	1:A:444:PRO:HA	1.99	0.44
1:B:361:ARG:H	1:B:365:HIS:HD2	1.65	0.44
1:A:392:ILE:HG23	1:A:397:GLN:NE2	2.33	0.43
1:B:309:MET:HE2	1:B:382:VAL:HB	2.01	0.43
1:B:143:GLN:OE1	1:B:434:LYS:NZ	2.51	0.42
1:B:499:PHE:HD2	1:B:540:GLY:HA3	1.84	0.42
1:B:489:ILE:HG12	1:B:523:ILE:HD13	2.00	0.42
1:A:10:ILE:HD12	1:A:96:LEU:HD23	2.02	0.42
1:A:76:PRO:HD3	1:A:88:VAL:HG21	2.02	0.41
1:B:357:ARG:HD3	1:B:388:ILE:HD11	2.01	0.41
1:B:448:LEU:HD12	1:B:448:LEU:HA	1.88	0.41
1:B:374:ARG:CD	1:B:580:VAL:HG13	2.50	0.41
1:A:209:ILE:HD11	1:A:288:ILE:HD11	2.02	0.41
1:A:364:LEU:HD12	1:A:365:HIS:N	2.35	0.41
1:A:491:ASN:HB3	1:A:534:THR:CG2	2.49	0.41
1:B:209:ILE:HD11	1:B:288:ILE:HD11	2.01	0.41
1:A:448:LEU:HD12	1:A:448:LEU:HA	1.89	0.41
1:A:85:VAL:O	1:A:89:MET:HG2	2.20	0.41
1:B:371:GLU:HG2	1:B:565:LEU:HD23	2.03	0.41
1:B:443:ILE:HG13	1:B:444:PRO:HD2	2.02	0.41
1:B:374:ARG:HD2	1:B:580:VAL:HG13	2.03	0.41
1:A:374:ARG:CD	1:A:580:VAL:HG13	2.51	0.40
1:A:255:LEU:HB2	1:A:275:ALA:HB3	2.03	0.40
1:B:115:LYS:O	1:B:119:HIS:HD2	2.05	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	575/607 (95%)	555 (96%)	20 (4%)	0	100	100
1	B	575/607 (95%)	555 (96%)	20 (4%)	0	100	100
All	All	1150/1214 (95%)	1110 (96%)	40 (4%)	0	100	100

There are no Ramachandran outliers to report.

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	A	496/519 (96%)	493 (99%)	3 (1%)	86	92
1	B	496/519 (96%)	493 (99%)	3 (1%)	86	92
All	All	992/1038 (96%)	986 (99%)	6 (1%)	86	92

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	41	ARG
1	A	54	ILE
1	A	225	ARG
1	B	364	LEU
1	B	436	ARG

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Mol	Chain	Res	Type
1	B	598	ARG

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](#)

Of 4 ligands modelled in this entry, 4 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	581/607 (95%)	0.69	52 (8%) 9 15	18, 32, 59, 109	0
1	B	581/607 (95%)	0.75	66 (11%) 5 8	20, 34, 65, 101	1 (0%)
All	All	1162/1214 (95%)	0.72	118 (10%) 6 11	18, 33, 64, 109	1 (0%)

All (118) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	550	GLY	8.9
1	A	550	GLY	8.6
1	A	37	GLU	7.3
1	A	601	ASN	7.0
1	B	37	GLU	6.9
1	B	549	SER	6.8
1	B	36	ALA	6.5
1	A	38	THR	6.4
1	B	38	THR	6.0
1	A	393	ASP	5.8
1	A	549	SER	5.6
1	B	392	ILE	5.6
1	A	600	ALA	5.3
1	A	168	LEU	5.1
1	B	552	ASP	5.1
1	A	395	ARG	5.0
1	A	39	GLN	4.9
1	B	54	ILE	4.8
1	A	36	ALA	4.7
1	A	552	ASP	4.6
1	B	598	ARG	4.6
1	B	393	ASP	4.5
1	B	601	ASN	4.5
1	A	41	ARG	4.4

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Mol	Chain	Res	Type	RSRZ
1	A	551	THR	4.4
1	B	599	ARG	4.4
1	B	551	THR	4.3
1	A	392	ILE	4.3
1	B	41	ARG	4.2
1	A	598	ARG	4.2
1	B	34	ALA	4.1
1	B	395	ARG	4.1
1	A	34	ALA	4.0
1	B	341	HIS	4.0
1	B	350	THR	3.9
1	B	600	ALA	3.9
1	B	40	GLU	3.8
1	A	54	ILE	3.8
1	A	390	ARG	3.7
1	A	55	THR	3.6
1	A	541	LYS	3.6
1	B	245	LYS	3.6
1	B	529	ARG	3.6
1	B	152	ASP	3.5
1	B	39	GLN	3.5
1	B	391	GLU	3.5
1	A	595	ASN	3.5
1	B	168	LEU	3.5
1	A	394	GLY	3.4
1	B	2	ILE	3.3
1	A	3	GLU	3.3
1	B	388	ILE	3.2
1	A	391	GLU	3.2
1	A	40	GLU	3.1
1	B	351	GLU	3.1
1	A	35	ARG	3.1
1	A	529	ARG	3.1
1	A	9	ALA	3.1
1	A	396	LYS	3.1
1	B	55	THR	3.1
1	B	530	SER	3.0
1	B	35	ARG	3.0
1	B	480	VAL	3.0
1	A	63	ILE	3.0
1	A	474	ASP	2.9
1	B	353	ALA	2.9

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Mol	Chain	Res	Type	RSRZ
1	A	2	ILE	2.9
1	A	131	ASP	2.8
1	A	343	VAL	2.8
1	B	516	ALA	2.8
1	A	73	VAL	2.8
1	B	329	ARG	2.8
1	A	540	GLY	2.8
1	B	540	GLY	2.7
1	A	152	ASP	2.7
1	B	340	VAL	2.7
1	B	389	PHE	2.7
1	B	595	ASN	2.7
1	A	56	ILE	2.6
1	B	394	GLY	2.6
1	B	33	ASP	2.6
1	B	73	VAL	2.6
1	A	479	GLU	2.6
1	B	349	GLU	2.6
1	A	201	LEU	2.5
1	B	364	LEU	2.5
1	A	21	LEU	2.5
1	B	478	GLY	2.4
1	B	296	ALA	2.4
1	A	25	LEU	2.4
1	B	479	GLU	2.4
1	B	343	VAL	2.4
1	B	553	GLU	2.3
1	B	390	ARG	2.3
1	A	475	ILE	2.3
1	B	331	ILE	2.3
1	B	9	ALA	2.3
1	B	320	GLY	2.3
1	A	14	VAL	2.3
1	A	295	GLU	2.3
1	B	63	ILE	2.3
1	B	244	GLY	2.3
1	A	478	GLY	2.2
1	A	67	ASP	2.2
1	B	473	ASP	2.2
1	B	56	ILE	2.2
1	A	8	ILE	2.2
1	B	145	PHE	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	163	ILE	2.2
1	B	337	LYS	2.1
1	A	96	LEU	2.1
1	B	333	ASP	2.1
1	B	382	VAL	2.1
1	B	203	GLY	2.1
1	B	477	PRO	2.1
1	B	3	GLU	2.0
1	A	388	ILE	2.0
1	B	423	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](#)

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
2	NA	B	701	1/1	0.64	0.31	28,28,28,28	0
2	NA	A	701	1/1	0.83	0.15	31,31,31,31	0
2	NA	A	702	1/1	0.89	0.23	32,32,32,32	0
2	NA	B	702	1/1	0.90	0.18	36,36,36,36	0

6.5 Other polymers [i](#)

There are no such residues in this entry.