



Full wwPDB X-ray Structure Validation Report ⓘ

May 23, 2023 – 10:23 AM EDT

PDB ID : 8SV0
Title : The crystal structure of the classical binding interface of Importin alpha 2 and nuclear localisation signal sequence in Psittacine siadenovirus core protein VII
Authors : Athukorala, A.; Sarker, S.; Forwood, J.K.; Donnelly, C.M.
Deposited on : 2023-05-14
Resolution : 2.20 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 : 2.33
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) : 2.33

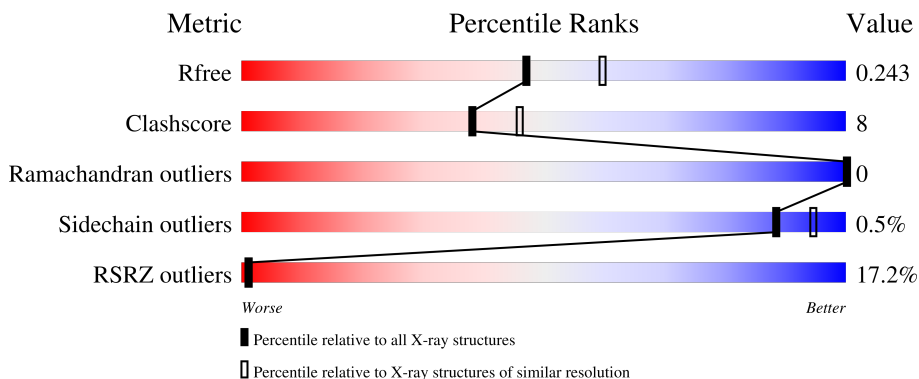
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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	B	510	
2	C	9	
2	E	9	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	NA	B	602	-	-	-	X

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 6938 atoms, of which 3476 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 Importin subunit alpha-1.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	B	427	6586	2073	3331	553	619	10	0	1	0

There are 50 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	20	MET	-	expression tag	UNP P52293
B	21	HIS	-	expression tag	UNP P52293
B	22	HIS	-	expression tag	UNP P52293
B	23	HIS	-	expression tag	UNP P52293
B	24	HIS	-	expression tag	UNP P52293
B	25	HIS	-	expression tag	UNP P52293
B	26	HIS	-	expression tag	UNP P52293
B	27	SER	-	expression tag	UNP P52293
B	28	SER	-	expression tag	UNP P52293
B	29	GLY	-	expression tag	UNP P52293
B	30	LEU	-	expression tag	UNP P52293
B	31	VAL	-	expression tag	UNP P52293
B	32	PRO	-	expression tag	UNP P52293
B	33	ARG	-	expression tag	UNP P52293
B	34	GLY	-	expression tag	UNP P52293
B	35	SER	-	expression tag	UNP P52293
B	36	GLY	-	expression tag	UNP P52293
B	37	MET	-	expression tag	UNP P52293
B	38	LEU	-	expression tag	UNP P52293
B	39	GLU	-	expression tag	UNP P52293
B	40	THR	-	expression tag	UNP P52293
B	41	ALA	-	expression tag	UNP P52293
B	42	ALA	-	expression tag	UNP P52293
B	43	ALA	-	expression tag	UNP P52293
B	44	LEU	-	expression tag	UNP P52293
B	45	PHE	-	expression tag	UNP P52293
B	46	GLU	-	expression tag	UNP P52293

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Chain	Residue	Modelled	Actual	Comment	Reference
B	47	ARG	-	expression tag	UNP P52293
B	48	ASN	-	expression tag	UNP P52293
B	49	HIS	-	expression tag	UNP P52293
B	50	MET	-	expression tag	UNP P52293
B	51	ASP	-	expression tag	UNP P52293
B	52	SER	-	expression tag	UNP P52293
B	53	PRO	-	expression tag	UNP P52293
B	54	ASP	-	expression tag	UNP P52293
B	55	LEU	-	expression tag	UNP P52293
B	56	GLY	-	expression tag	UNP P52293
B	57	THR	-	expression tag	UNP P52293
B	58	ASP	-	expression tag	UNP P52293
B	59	ASP	-	expression tag	UNP P52293
B	60	ASP	-	expression tag	UNP P52293
B	61	ASP	-	expression tag	UNP P52293
B	62	LEU	-	expression tag	UNP P52293
B	63	ALA	-	expression tag	UNP P52293
B	64	MET	-	expression tag	UNP P52293
B	65	ALA	-	expression tag	UNP P52293
B	66	ASP	-	expression tag	UNP P52293
B	67	ILE	-	expression tag	UNP P52293
B	68	GLY	-	expression tag	UNP P52293
B	69	SER	-	expression tag	UNP P52293

- Molecule 2 is a protein called protein VII.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace	
2	C	5	Total	C	H	N	O	0	0	0
			113	33	60	15	5			
2	E	9	Total	C	H	N	O	0	0	0
			161	48	85	19	9			

- Molecule 3 is SODIUM ION (three-letter code: NA) (formula: Na).

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

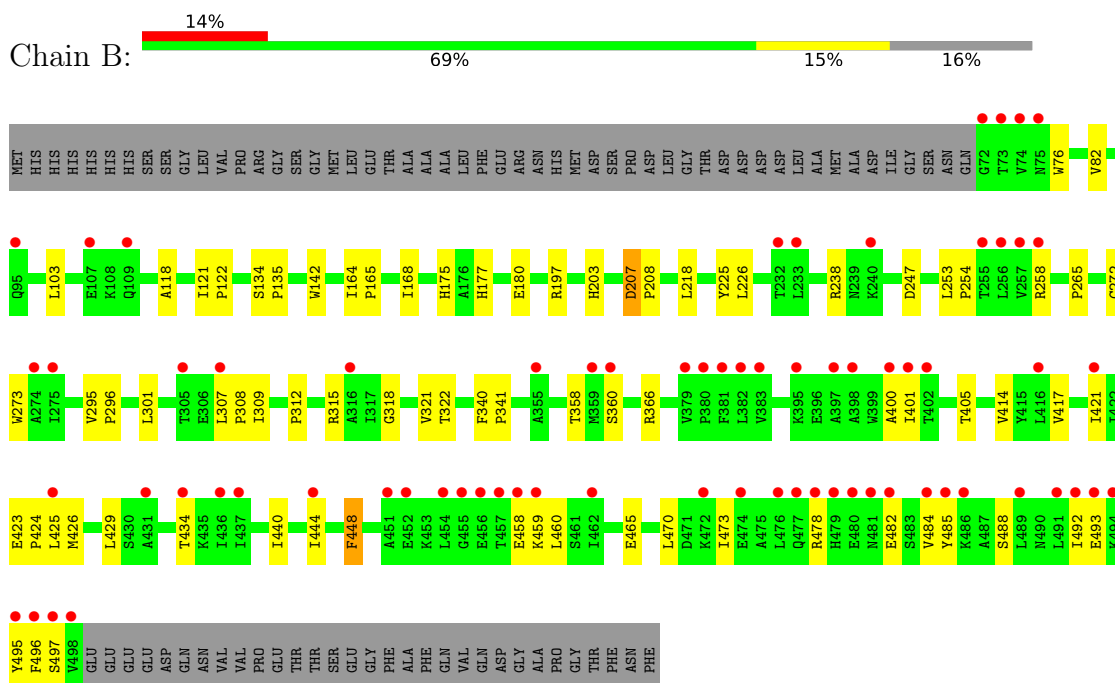
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	74	Total O 74 74	0	0
4	E	2	Total O 2 2	0	0

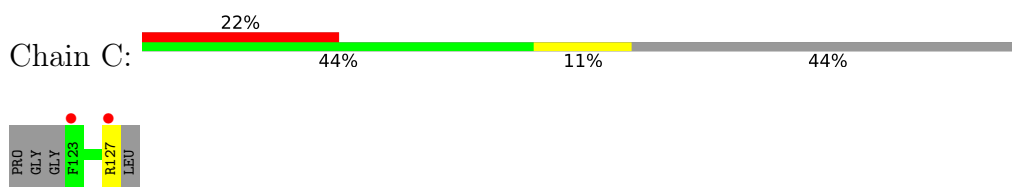
3 Residue-property plots [i](#)

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.

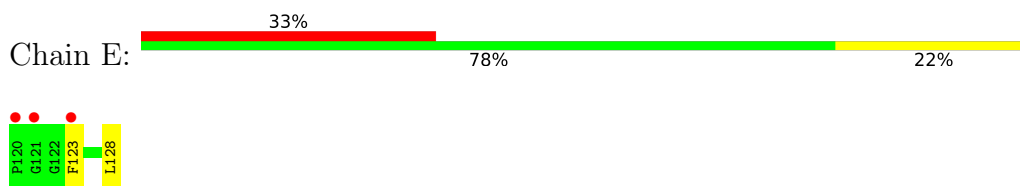
- Molecule 1: Importin subunit alpha-1



- Molecule 2: protein VII



- Molecule 2: protein VII



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	77.22Å 88.73Å 96.41Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.67 – 2.20 29.67 – 2.20	Depositor EDS
% Data completeness (in resolution range)	99.4 (29.67-2.20) 99.6 (29.67-2.20)	Depositor EDS
R_{merge}	0.16	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.14 (at 2.20Å)	Xtrriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, R_{free}	0.229 , 0.242 0.229 , 0.243	Depositor DCC
R_{free} test set	1679 reflections (4.92%)	wwPDB-VP
Wilson B-factor (Å ²)	51.5	Xtrriage
Anisotropy	0.332	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.41 , 54.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	6938	wwPDB-VP
Average B, all atoms (Å ²)	76.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.99% 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:
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	B	0.52	0/3316	0.60	0/4520
2	C	0.44	0/53	0.79	0/66
2	E	0.41	0/77	0.80	0/98
All	All	0.51	0/3446	0.61	0/4684

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	B	0	6
2	C	0	1
All	All	0	7

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (7) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	197	ARG	Sidechain
1	B	258[A]	ARG	Sidechain
1	B	258[B]	ARG	Sidechain
1	B	315	ARG	Sidechain
1	B	366	ARG	Sidechain
1	B	478	ARG	Sidechain
2	C	127	ARG	Sidechain

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	B	3255	3331	3331	52	0
2	C	53	60	60	0	0
2	E	76	85	85	3	0
3	B	2	0	0	0	0
4	B	74	0	0	1	0
4	E	2	0	0	0	0
All	All	3462	3476	3476	52	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 8.

All (52) 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:B:247:ASP:OD2	4:B:701:HOH:O	1.99	0.79
1:B:429:LEU:HG	1:B:440:ILE:HG21	1.77	0.65
1:B:321:VAL:HG21	1:B:358:THR:HG23	1.83	0.60
1:B:482:GLU:HA	1:B:485:TYR:CE2	2.37	0.59
1:B:465:GLU:HG3	1:B:470:LEU:HD23	1.87	0.57
1:B:401:ILE:O	1:B:405:THR:HG23	2.05	0.56
1:B:448:PHE:CD1	1:B:460:LEU:HD23	2.39	0.56
1:B:134:SER:N	1:B:135:PRO:CD	2.70	0.55
1:B:272:CYS:SG	1:B:301:LEU:HD13	2.47	0.55
1:B:448:PHE:CD1	1:B:495:TYR:CD2	2.96	0.54
1:B:318:GLY:O	1:B:322:THR:HG23	2.07	0.54
1:B:482:GLU:HA	1:B:485:TYR:CZ	2.42	0.54
1:B:307:LEU:N	1:B:308:PRO:CD	2.71	0.54
1:B:218:LEU:HB3	1:B:226:LEU:HD11	1.90	0.54
1:B:340:PHE:N	1:B:341:PRO:CD	2.71	0.54
1:B:448:PHE:HB3	1:B:495:TYR:CZ	2.44	0.52
1:B:425:LEU:HG	1:B:440:ILE:HG23	1.90	0.52
1:B:426:MET:HE1	1:B:429:LEU:HD12	1.94	0.50
1:B:473:ILE:HG22	1:B:492:ILE:HD11	1.94	0.48
1:B:425:LEU:HD21	1:B:444:ILE:HG13	1.96	0.48
1:B:76:TRP:O	1:B:103:LEU:HD11	2.15	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:470:LEU:HD12	1:B:470:LEU:O	2.15	0.46
1:B:492:ILE:HA	1:B:496:PHE:HB2	1.98	0.46
1:B:448:PHE:HB3	1:B:495:TYR:CE2	2.51	0.45
1:B:121:ILE:N	1:B:122:PRO:CD	2.79	0.44
1:B:426:MET:CE	1:B:429:LEU:HD12	2.47	0.44
1:B:414:VAL:O	1:B:417:VAL:HG22	2.17	0.44
1:B:458:GLU:HG2	1:B:459:LYS:N	2.32	0.44
1:B:142:TRP:CZ2	2:E:128:LEU:HD22	2.53	0.43
1:B:295:VAL:N	1:B:296:PRO:CD	2.81	0.43
1:B:265:PRO:HA	1:B:309:ILE:HD11	2.00	0.43
1:B:273:TRP:CD1	1:B:312:PRO:HB3	2.54	0.43
1:B:253:LEU:N	1:B:254:PRO:CD	2.81	0.43
1:B:82:VAL:HG21	1:B:118:ALA:HB1	2.01	0.43
1:B:434:THR:HG23	1:B:484:VAL:HG21	2.00	0.42
1:B:318:GLY:HA2	1:B:321:VAL:HG22	2.01	0.42
1:B:175:HIS:HB3	1:B:177:HIS:CE1	2.55	0.42
1:B:485:TYR:HA	1:B:488:SER:HB3	2.00	0.42
1:B:180:GLU:HB2	1:B:225:TYR:HD1	1.85	0.42
1:B:417:VAL:HA	1:B:421:ILE:HG22	2.02	0.41
1:B:238:ARG:CD	2:E:123:PHE:CE1	3.04	0.41
1:B:425:LEU:CD1	1:B:440:ILE:HG23	2.51	0.41
1:B:164:ILE:N	1:B:165:PRO:HD2	2.35	0.41
1:B:207:ASP:N	1:B:208:PRO:HD2	2.36	0.41
1:B:318:GLY:O	1:B:321:VAL:HG22	2.20	0.41
1:B:493:GLU:HA	1:B:497:SER:HB3	2.03	0.41
1:B:168:ILE:CD1	1:B:203:HIS:HB3	2.51	0.41
1:B:238:ARG:HD3	2:E:123:PHE:CE1	2.56	0.41
1:B:273:TRP:CG	1:B:312:PRO:HB3	2.56	0.41
1:B:423:GLU:N	1:B:424:PRO:HD2	2.36	0.40
1:B:360:SER:HA	1:B:400:ALA:HA	2.03	0.40
1:B:473:ILE:HG22	1:B:492:ILE:CD1	2.51	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	B	426/510 (84%)	419 (98%)	7 (2%)	0	100	100
2	C	3/9 (33%)	3 (100%)	0	0	100	100
2	E	7/9 (78%)	7 (100%)	0	0	100	100
All	All	436/528 (83%)	429 (98%)	7 (2%)	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	B	358/426 (84%)	356 (99%)	2 (1%)	86	93
2	C	5/7 (71%)	5 (100%)	0	100	100
2	E	7/7 (100%)	7 (100%)	0	100	100
All	All	370/440 (84%)	368 (100%)	2 (0%)	88	94

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	207	ASP
1	B	448	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	203	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 monosaccharides 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	B	427/510 (83%)	0.79	71 (16%) 1 1	47, 61, 117, 135	0
2	C	5/9 (55%)	1.42	2 (40%) 0 0	72, 80, 89, 99	0
2	E	9/9 (100%)	1.25	3 (33%) 0 0	61, 67, 110, 113	0
All	All	441/528 (83%)	0.81	76 (17%) 1 1	47, 61, 116, 135	0

All (76) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	497	SER	6.1
1	B	498	VAL	5.8
1	B	485	TYR	5.7
1	B	496	PHE	5.5
1	B	479	HIS	4.7
2	E	121	GLY	4.7
1	B	476	LEU	4.7
1	B	484	VAL	4.6
1	B	462	ILE	4.3
1	B	477	GLN	4.2
1	B	493	GLU	4.2
1	B	74	VAL	3.8
1	B	401	ILE	3.8
1	B	492	ILE	3.7
1	B	400	ALA	3.7
1	B	491	LEU	3.6
1	B	480	GLU	3.6
1	B	454	LEU	3.5
1	B	457	THR	3.5
1	B	379	VAL	3.4
1	B	451	ALA	3.3
1	B	458	GLU	3.2
1	B	421	ILE	3.2

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Mol	Chain	Res	Type	RSRZ
1	B	434	THR	3.2
1	B	402	THR	3.1
1	B	494	LYS	3.1
1	B	481	ASN	3.0
1	B	258[A]	ARG	3.0
1	B	75	ASN	3.0
1	B	398	ALA	3.0
1	B	459	LYS	3.0
1	B	305	THR	3.0
1	B	397	ALA	2.9
1	B	489	LEU	2.9
2	C	123	PHE	2.9
1	B	257	VAL	2.9
1	B	380	PRO	2.8
2	E	120	PRO	2.8
1	B	437	ILE	2.8
1	B	472	LYS	2.8
1	B	383	VAL	2.7
1	B	73	THR	2.7
1	B	482	GLU	2.7
1	B	256	LEU	2.7
2	E	123	PHE	2.7
1	B	474	GLU	2.6
1	B	478	ARG	2.6
1	B	72	GLY	2.6
1	B	495	TYR	2.6
1	B	486	LYS	2.6
1	B	382	LEU	2.5
1	B	274	ALA	2.5
1	B	395	LYS	2.5
1	B	233	LEU	2.5
1	B	359	MET	2.5
1	B	307	LEU	2.4
1	B	360	SER	2.4
1	B	456	GLU	2.4
1	B	416	LEU	2.4
1	B	425	LEU	2.3
2	C	127	ARG	2.3
1	B	275	ILE	2.3
1	B	455	GLY	2.3
1	B	436	ILE	2.3
1	B	109	GLN	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	431	ALA	2.2
1	B	255	THR	2.2
1	B	381	PHE	2.1
1	B	107	GLU	2.1
1	B	444	ILE	2.1
1	B	95	GLN	2.1
1	B	452	GLU	2.1
1	B	355	ALA	2.1
1	B	316	ALA	2.0
1	B	232	THR	2.0
1	B	240	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
3	NA	B	602	1/1	0.67	0.55	88,88,88,88	0
3	NA	B	601	1/1	0.69	0.30	76,76,76,76	0

6.5 Other polymers [i](#)

There are no such residues in this entry.