



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 07:40 PM UTC

PDB ID : 7V7L / pdb_00007v7l
Title : Crystal Structure of the Heterodimeric HIF-3a:ARNT Complex
Authors : Diao, X.; Ren, X.; Li, F.W.; Sun, X.; Wu, D.
Deposited on : 2021-08-21
Resolution : 2.30 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

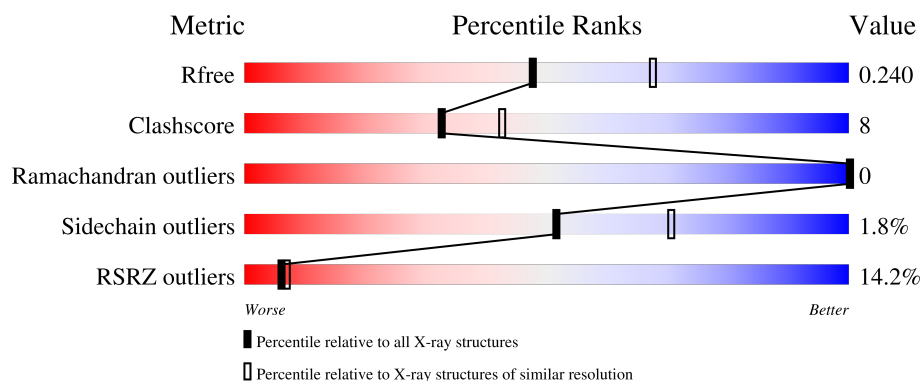
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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	6319 (2.30-2.30)
Clashscore	190562	6919 (2.30-2.30)
Ramachandran outliers	187476	6854 (2.30-2.30)
Sidechain outliers	187428	6854 (2.30-2.30)
RSRZ outliers	180081	6325 (2.30-2.30)

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	359	11% 61% 16% • 22%
2	B	364	12% 67% 15% 18%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4877 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 Aryl hydrocarbon receptor nuclear translocator.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	280	Total	C	N	O	S	0	1	0
			2266	1430	396	422	18			

There are 26 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	81	MET	-	initiating methionine	UNP P53762
A	?	-	LEU	deletion	UNP P53762
A	?	-	THR	deletion	UNP P53762
A	?	-	GLY	deletion	UNP P53762
A	?	-	ARG	deletion	UNP P53762
A	?	-	VAL	deletion	UNP P53762
A	?	-	LEU	deletion	UNP P53762
A	?	-	ASP	deletion	UNP P53762
A	?	-	LEU	deletion	UNP P53762
A	?	-	LYS	deletion	UNP P53762
A	?	-	THR	deletion	UNP P53762
A	?	-	GLY	deletion	UNP P53762
A	?	-	THR	deletion	UNP P53762
A	?	-	VAL	deletion	UNP P53762
A	?	-	LYS	deletion	UNP P53762
A	?	-	LYS	deletion	UNP P53762
A	?	-	GLU	deletion	UNP P53762
A	?	-	GLY	deletion	UNP P53762
A	?	-	GLN	deletion	UNP P53762
A	?	-	GLN	deletion	UNP P53762
A	?	-	SER	deletion	UNP P53762
A	?	-	SER	deletion	UNP P53762
A	?	-	MET	deletion	UNP P53762
A	?	-	ARG	deletion	UNP P53762
A	?	-	MET	deletion	UNP P53762
A	?	-	CYS	deletion	UNP P53762

- Molecule 2 is a protein called Hypoxia-inducible factor 3-alpha.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	299	Total	C	N	O	S	0	1	0
			2345	1477	413	439	16			

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	3	MET	-	initiating methionine	UNP Q0VBL6
B	359	LEU	-	expression tag	UNP Q0VBL6
B	360	GLU	-	expression tag	UNP Q0VBL6
B	361	HIS	-	expression tag	UNP Q0VBL6
B	362	HIS	-	expression tag	UNP Q0VBL6
B	363	HIS	-	expression tag	UNP Q0VBL6
B	364	HIS	-	expression tag	UNP Q0VBL6
B	365	HIS	-	expression tag	UNP Q0VBL6
B	366	HIS	-	expression tag	UNP Q0VBL6

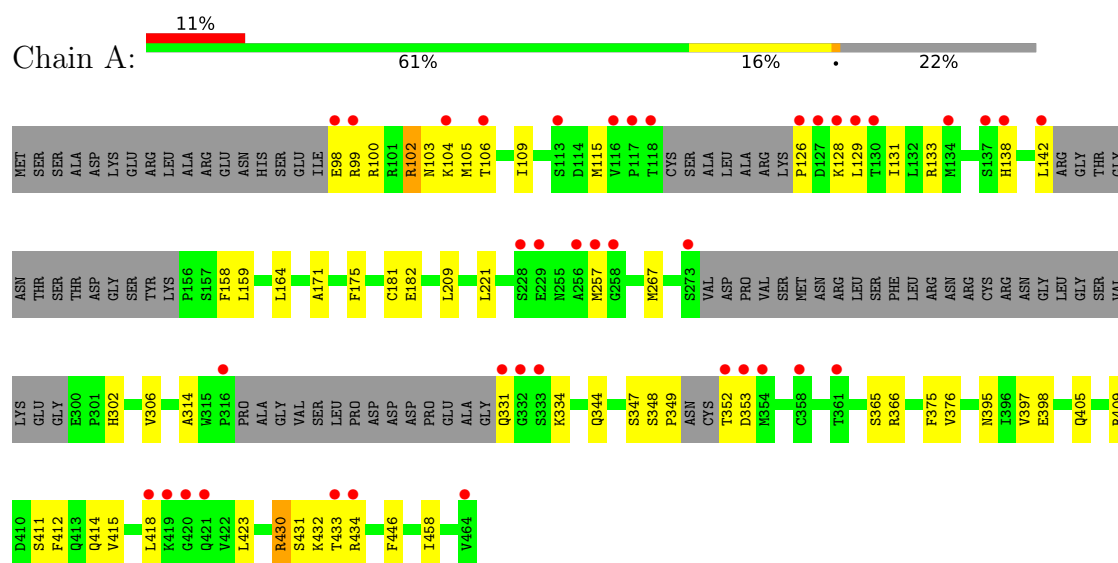
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	135	Total	O	0	0
			135	135		
3	B	131	Total	O	0	0
			131	131		

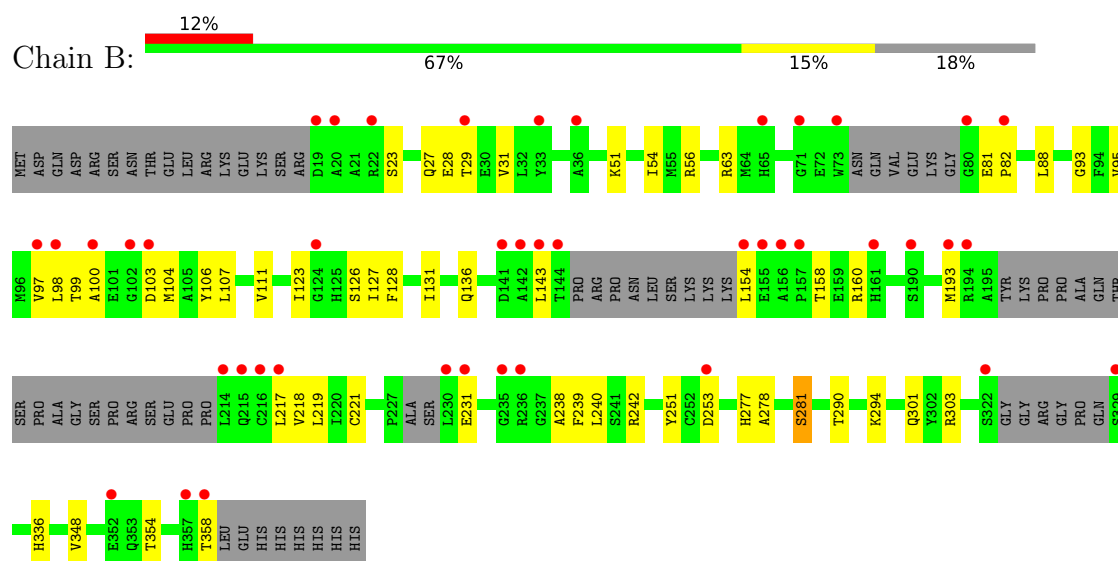
3 Residue-property plots [i](#)

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: Aryl hydrocarbon receptor nuclear translocator



- Molecule 2: Hypoxia-inducible factor 3-alpha



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	65.84Å 86.29Å 143.70Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	36.99 – 2.30 36.99 – 2.30	Depositor EDS
% Data completeness (in resolution range)	69.2 (36.99-2.30) 93.8 (36.99-2.30)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.78 (at 2.29Å)	Xtriage
Refinement program	PHENIX 1.14	Depositor
R, R_{free}	0.204 , 0.245 0.205 , 0.240	Depositor DCC
R_{free} test set	2000 reflections (5.48%)	wwPDB-VP
Wilson B-factor (Å ²)	27.4	Xtriage
Anisotropy	0.083	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 54.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	4877	wwPDB-VP
Average B, all atoms (Å ²)	46.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.89% 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	A	0.55	3/2315 (0.1%)	0.70	4/3123 (0.1%)
2	B	0.37	0/2392	0.49	0/3234
All	All	0.47	3/4707 (0.1%)	0.60	4/6357 (0.1%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	430	ARG	C-O	-5.61	1.17	1.24
1	A	181	CYS	C-O	-5.43	1.17	1.24
1	A	182	GLU	C-O	-5.20	1.17	1.24

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	103	ASN	CB-CA-C	5.58	121.77	110.38
1	A	432	LYS	N-CA-C	-5.52	105.34	111.36
1	A	100	ARG	N-CA-C	-5.07	105.67	111.14
1	A	99	ARG	N-CA-C	-5.01	105.91	112.23

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	2266	0	2235	42	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	2345	0	2318	37	0
3	A	135	0	0	6	0
3	B	131	0	0	0	0
All	All	4877	0	4553	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 8.

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:431:SER:HB2	1:A:433:THR:O	1.49	1.10
1:A:353:ASP:HA	3:A:594:HOH:O	1.77	0.85
1:A:102:ARG:HG3	1:A:102:ARG:HH11	1.43	0.83
1:A:129:LEU:HB2	2:B:28:GLU:HG2	1.64	0.79
1:A:353:ASP:HB3	3:A:594:HOH:O	1.83	0.78
1:A:353:ASP:CB	3:A:594:HOH:O	2.34	0.74
1:A:102:ARG:HG3	1:A:102:ARG:NH1	2.02	0.73
2:B:348:VAL:HG11	2:B:354:THR:HB	1.70	0.72
1:A:102:ARG:HH11	1:A:102:ARG:CG	2.09	0.66
1:A:353:ASP:HB2	3:A:575:HOH:O	1.97	0.64
2:B:23:SER:O	2:B:27:GLN:HG3	1.98	0.63
1:A:415:VAL:HG12	1:A:423:LEU:HB3	1.81	0.63
1:A:164:LEU:HD11	2:B:95:VAL:HG21	1.81	0.62
1:A:349:PRO:HB3	2:B:301:GLN:O	1.99	0.62
2:B:128:PHE:HD1	2:B:136:GLN:HG2	1.64	0.62
1:A:431:SER:CB	1:A:433:THR:O	2.39	0.62
1:A:348:SER:O	2:B:154:LEU:HD21	2.00	0.61
2:B:240:LEU:H	2:B:253:ASP:HB2	1.64	0.61
2:B:127:ILE:O	2:B:131:ILE:HG12	2.04	0.56
1:A:411:SER:O	1:A:415:VAL:HG13	2.07	0.55
2:B:29:THR:HG22	2:B:51:LYS:HE2	1.88	0.55
2:B:238:ALA:HA	2:B:336:HIS:O	2.07	0.55
2:B:242:ARG:HB2	2:B:251:TYR:HB3	1.88	0.55
2:B:158:THR:OG1	2:B:193:MET:HB2	2.07	0.54
1:A:138:HIS:O	1:A:142:LEU:HD12	2.07	0.54
2:B:100:ALA:HA	2:B:143:LEU:HD21	1.88	0.53
2:B:128:PHE:CD1	2:B:136:GLN:HG2	2.43	0.53
2:B:27:GLN:O	2:B:31:VAL:HG12	2.09	0.53
1:A:366:ARG:HB2	1:A:375:PHE:HB3	1.90	0.53
1:A:344:GLN:NE2	1:A:348:SER:OG	2.37	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:107:LEU:HD22	2:B:111:VAL:HG21	1.92	0.52
2:B:217:LEU:HG	2:B:219:LEU:HD21	1.92	0.51
1:A:331:GLN:N	3:A:505:HOH:O	2.44	0.51
1:A:331:GLN:HB2	1:A:334:LYS:HE2	1.95	0.49
2:B:239:PHE:HB2	2:B:253:ASP:HB3	1.94	0.49
2:B:98:LEU:HD23	2:B:104:MET:HA	1.93	0.49
2:B:99:THR:O	2:B:143:LEU:HD11	2.13	0.48
1:A:158:PHE:HD2	1:A:159:LEU:HD13	1.78	0.48
2:B:290:THR:HG23	2:B:294:LYS:HD2	1.94	0.48
1:A:257:MET:HE1	1:A:314:ALA:HB3	1.96	0.47
1:A:129:LEU:HD23	1:A:129:LEU:C	2.40	0.47
1:A:353:ASP:N	1:A:353:ASP:OD1	2.36	0.47
2:B:278:ALA:O	2:B:281:SER:HB2	2.14	0.47
1:A:405:GLN:O	1:A:409:ARG:HG3	2.15	0.47
1:A:164:LEU:HD21	2:B:88:LEU:HD22	1.96	0.47
2:B:97:VAL:CG1	2:B:106:TYR:HB3	2.46	0.46
2:B:103:ASP:HA	2:B:126:SER:HA	1.98	0.45
1:A:267:MET:HE3	1:A:306:VAL:HG21	1.98	0.45
2:B:56:ARG:NH1	2:B:123:ILE:O	2.42	0.45
2:B:81:GLU:HG3	2:B:82:PRO:HD2	1.98	0.45
1:A:129:LEU:HD21	1:A:133:ARG:HE	1.81	0.45
1:A:105:MET:O	1:A:109:ILE:HG12	2.17	0.45
1:A:365:SER:HB3	1:A:376:VAL:HG12	1.99	0.45
1:A:446:PHE:HB2	1:A:458:ILE:HD11	2.00	0.44
1:A:128:LYS:O	1:A:131:ILE:HB	2.17	0.44
1:A:209:LEU:HD23	1:A:221:LEU:HD11	1.99	0.44
2:B:143:LEU:HD23	2:B:143:LEU:O	2.19	0.43
2:B:160:ARG:HG3	2:B:217:LEU:HD11	2.01	0.43
1:A:302:HIS:HD2	3:A:616:HOH:O	2.01	0.43
2:B:51:LYS:HA	2:B:54:ILE:HD12	2.00	0.43
2:B:277:HIS:HB2	2:B:303:ARG:HB2	2.01	0.43
2:B:158:THR:OG1	2:B:193:MET:O	2.33	0.43
1:A:126:PRO:HG2	1:A:131:ILE:HG12	2.01	0.42
1:A:115:MET:HE2	2:B:63:ARG:HG2	2.00	0.42
1:A:395:ASN:OD1	1:A:397:VAL:HG23	2.20	0.41
1:A:412:PHE:O	1:A:415:VAL:HG22	2.20	0.41
2:B:93:GLY:HA3	2:B:221:CYS:O	2.19	0.41
1:A:171:ALA:HB2	2:B:218:VAL:HG12	2.01	0.41
1:A:175:PHE:HZ	1:A:267:MET:HE1	1.86	0.41
1:A:398:GLU:O	1:A:430:ARG:NH2	2.53	0.41
1:A:414:GLN:O	1:A:418:LEU:HG	2.20	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:354:THR:O	2:B:358:THR:HG23	2.21	0.41

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	269/359 (75%)	262 (97%)	7 (3%)	0	100	100
2	B	288/364 (79%)	285 (99%)	3 (1%)	0	100	100
All	All	557/723 (77%)	547 (98%)	10 (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	A	261/325 (80%)	254 (97%)	7 (3%)	39	58
2	B	255/311 (82%)	253 (99%)	2 (1%)	73	86
All	All	516/636 (81%)	507 (98%)	9 (2%)	51	72

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	98	GLU
1	A	102	ARG
1	A	104	LYS
1	A	106	THR
1	A	347	SER
1	A	352	THR
1	A	434	ARG
2	B	231	GLU
2	B	281	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	103	ASN
1	A	447	GLN
2	B	119	GLN
2	B	315	GLN

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 ⓘ

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	280/359 (77%)	0.57	39 (13%) 6 7	19, 36, 97, 133	1 (0%)
2	B	299/364 (82%)	0.75	43 (14%) 6 7	17, 42, 89, 114	1 (0%)
All	All	579/723 (80%)	0.66	82 (14%) 6 7	17, 39, 97, 133	2 (0%)

All (82) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	352	THR	6.3
1	A	316	PRO	5.8
2	B	156	ALA	5.3
1	A	134	MET	5.3
2	B	230	LEU	5.0
1	A	353	ASP	4.7
2	B	358	THR	4.4
1	A	257	MET	4.3
2	B	29	THR	4.2
2	B	236	ARG	4.1
2	B	193	MET	4.1
1	A	118	THR	4.0
1	A	113	SER	4.0
2	B	216	CYS	3.7
2	B	100	ALA	3.7
1	A	128	LYS	3.5
2	B	154	LEU	3.4
1	A	419	LYS	3.4
2	B	19	ASP	3.4
2	B	97	VAL	3.3
1	A	117	PRO	3.3
1	A	99	ARG	3.2
2	B	143	LEU	3.2
2	B	20	ALA	3.2

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Mol	Chain	Res	Type	RSRZ
1	A	129	LEU	3.2
2	B	214	LEU	3.2
1	A	256	ALA	3.1
2	B	80	GLY	3.1
1	A	98	GLU	3.1
2	B	73	TRP	3.1
1	A	126	PRO	3.1
1	A	418	LEU	3.1
1	A	358	CYS	3.0
2	B	33	TYR	3.0
2	B	65	HIS	3.0
2	B	144	THR	3.0
2	B	141	ASP	3.0
1	A	273	SER	2.9
2	B	71	GLY	2.9
2	B	235	GLY	2.9
1	A	361	THR	2.9
2	B	22	ARG	2.8
2	B	329	SER	2.7
1	A	258	GLY	2.7
2	B	155	GLU	2.7
1	A	354	MET	2.7
2	B	142	ALA	2.6
1	A	433	THR	2.6
2	B	215	GLN	2.6
1	A	332	GLY	2.6
2	B	161	HIS	2.6
2	B	194	ARG	2.5
2	B	36	ALA	2.4
2	B	82	PRO	2.4
2	B	157	PRO	2.4
2	B	352	GLU	2.4
1	A	228	SER	2.4
1	A	434	ARG	2.4
1	A	106	THR	2.4
2	B	357	HIS	2.3
1	A	421	GLN	2.3
2	B	102	GLY	2.3
1	A	464	VAL	2.3
2	B	103	ASP	2.2
1	A	420	GLY	2.2
1	A	104	LYS	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	137	SER	2.2
1	A	142	LEU	2.2
1	A	333	SER	2.2
2	B	217	LEU	2.2
1	A	127	ASP	2.2
2	B	253	ASP	2.2
2	B	231	GLU	2.2
2	B	98	LEU	2.1
1	A	229	GLU	2.1
2	B	322	SER	2.1
1	A	116	VAL	2.1
2	B	190	SER	2.1
1	A	130	THR	2.1
1	A	138	HIS	2.1
2	B	124	GLY	2.0
1	A	331	GLN	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.