



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 06:02 AM UTC

PDB ID : 7PJH / pdb_00007pjh
Title : Crystal structure of the human spliceosomal maturation factor AAR2 bound to the RNase H domain of PRPF8
Authors : Preussner, M.; Santos, K.; Heroven, A.C.; Alles, J.; Heyd, F.; Wahl, M.C.; Weber, G.
Deposited on : 2021-08-24
Resolution : 2.35 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

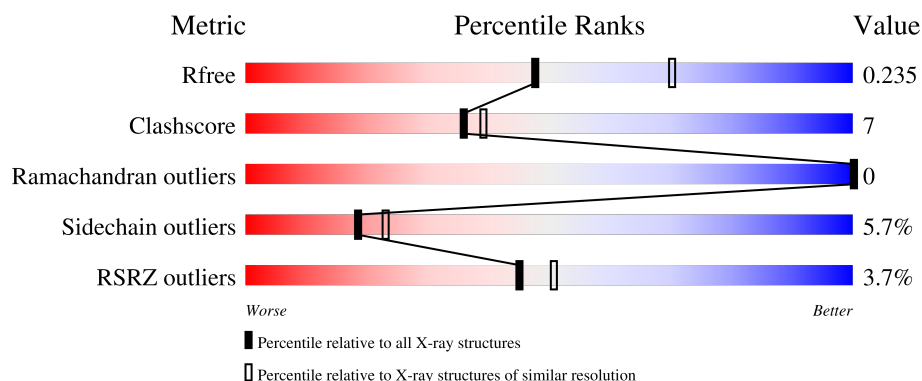
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

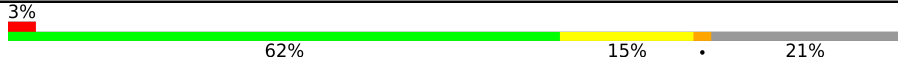
The reported resolution of this entry is 2.35 Å.

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	1596 (2.36-2.36)
Clashscore	190562	1663 (2.36-2.36)
Ramachandran outliers	187476	1646 (2.36-2.36)
Sidechain outliers	187428	1646 (2.36-2.36)
RSRZ outliers	180081	1598 (2.36-2.36)

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	401	 3% 62% 15% • 21%
2	B	259	 3% 83% 15% ••

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4790 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 Protein AAR2 homolog.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	317	2554	1655	424	462	13	0	3	0

There are 57 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-27	MET	-	initiating methionine	UNP Q9Y312
A	-26	LYS	-	expression tag	UNP Q9Y312
A	-25	HIS	-	expression tag	UNP Q9Y312
A	-24	HIS	-	expression tag	UNP Q9Y312
A	-23	HIS	-	expression tag	UNP Q9Y312
A	-22	HIS	-	expression tag	UNP Q9Y312
A	-21	HIS	-	expression tag	UNP Q9Y312
A	-20	HIS	-	expression tag	UNP Q9Y312
A	-19	PRO	-	expression tag	UNP Q9Y312
A	-18	MET	-	expression tag	UNP Q9Y312
A	-17	SER	-	expression tag	UNP Q9Y312
A	-16	ASP	-	expression tag	UNP Q9Y312
A	-15	TYR	-	expression tag	UNP Q9Y312
A	-14	ASP	-	expression tag	UNP Q9Y312
A	-13	ILE	-	expression tag	UNP Q9Y312
A	-12	PRO	-	expression tag	UNP Q9Y312
A	-11	THR	-	expression tag	UNP Q9Y312
A	-10	THR	-	expression tag	UNP Q9Y312
A	-9	GLU	-	expression tag	UNP Q9Y312
A	-8	ASN	-	expression tag	UNP Q9Y312
A	-7	LEU	-	expression tag	UNP Q9Y312
A	-6	TYR	-	expression tag	UNP Q9Y312
A	-5	PHE	-	expression tag	UNP Q9Y312
A	-4	GLN	-	expression tag	UNP Q9Y312
A	-3	GLY	-	expression tag	UNP Q9Y312
A	-2	ALA	-	expression tag	UNP Q9Y312
A	-1	GLU	-	expression tag	UNP Q9Y312

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Chain	Residue	Modelled	Actual	Comment	Reference
A	0	PHE	-	expression tag	UNP Q9Y312
A	?	-	VAL	deletion	UNP Q9Y312
A	180	SER	THR	conflict	UNP Q9Y312
A	181	SER	LYS	conflict	UNP Q9Y312
A	182	SER	ASP	conflict	UNP Q9Y312
A	184	ALA	VAL	conflict	UNP Q9Y312
A	186	THR	GLN	conflict	UNP Q9Y312
A	187	GLU	ASN	conflict	UNP Q9Y312
A	188	ILE	LEU	conflict	UNP Q9Y312
A	189	ARG	PRO	conflict	UNP Q9Y312
A	190	PHE	ARG	conflict	UNP Q9Y312
A	191	SER	CYS	conflict	UNP Q9Y312
A	192	GLU	GLY	conflict	UNP Q9Y312
A	193	LEU	ILE	conflict	UNP Q9Y312
A	194	PRO	GLU	conflict	UNP Q9Y312
A	195	THR	CYS	conflict	UNP Q9Y312
A	196	GLN	LYS	conflict	UNP Q9Y312
A	197	MET	SER	conflict	UNP Q9Y312
A	198	PHE	TYR	conflict	UNP Q9Y312
A	199	PRO	GLN	conflict	UNP Q9Y312
A	?	-	GLY	deletion	UNP Q9Y312
A	?	-	LEU	deletion	UNP Q9Y312
A	?	-	ALA	deletion	UNP Q9Y312
A	?	-	ARG	deletion	UNP Q9Y312
A	?	-	LEU	deletion	UNP Q9Y312
A	?	-	PRO	deletion	UNP Q9Y312
A	?	-	GLU	deletion	UNP Q9Y312
A	?	-	MET	deletion	UNP Q9Y312
A	?	-	LYS	deletion	UNP Q9Y312
A	?	-	PRO	deletion	UNP Q9Y312

- Molecule 2 is a protein called Pre-mRNA-processing-splicing factor 8.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	257	Total	C	N	O	S	0	1	0
			2088	1358	350	376	4			

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	78	Total	O	0	0
			78	78		

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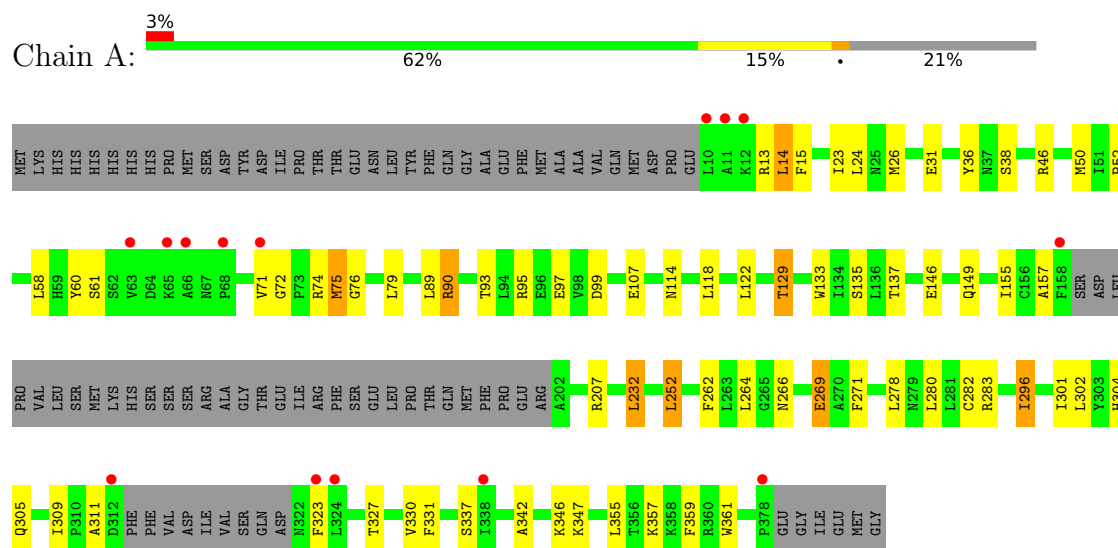
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	69	Total	O	0	1
			70	70		

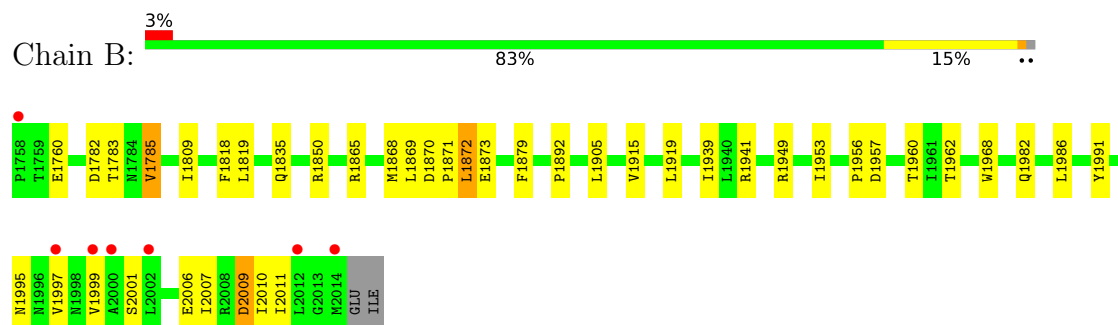
3 Residue-property plots [i](#)

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: Protein AAR2 homolog



- Molecule 2: Pre-mRNA-processing-splicing factor 8



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	145.28Å 57.26Å 111.23Å 90.00° 112.74° 90.00°	Depositor
Resolution (Å)	48.21 – 2.35 48.21 – 2.35	Depositor EDS
% Data completeness (in resolution range)	97.7 (48.21-2.35) 97.7 (48.21-2.35)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.15 (at 2.34Å)	Xtriage
Refinement program	PHENIX 1.19.2_4158, PHENIX 1.19.2_4158	Depositor
R, R_{free}	0.189 , 0.235 0.189 , 0.235	Depositor DCC
R_{free} test set	1723 reflections (4.85%)	wwPDB-VP
Wilson B-factor (Å ²)	55.4	Xtriage
Anisotropy	0.686	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.28 , 47.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	4790	wwPDB-VP
Average B, all atoms (Å ²)	77.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.90% 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	0.40	0/2627	0.56	0/3561
2	B	0.39	0/2138	0.59	0/2905
All	All	0.39	0/4765	0.58	0/6466

There are no bond length outliers.

There are no bond angle outliers.

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	2554	0	2541	41	0
2	B	2088	0	2156	27	0
3	A	78	0	0	4	0
3	B	70	0	0	1	0
All	All	4790	0	4697	68	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 7.

All (68) 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)
2:B:1957:ASP:HB3	2:B:1960:THR:HG23	1.75	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:36:TYR:HB2	1:A:129:THR:HG21	1.78	0.66
1:A:74:ARG:HB3	3:A:401:HOH:O	1.96	0.65
1:A:14:LEU:HD21	1:A:52:PRO:HG3	1.78	0.65
1:A:309:ILE:HG22	1:A:311:ALA:H	1.62	0.64
1:A:23:ILE:HG22	1:A:89:LEU:HB2	1.79	0.63
1:A:282:CYS:HB3	1:A:331:PHE:HB2	1.79	0.62
1:A:252:LEU:HG	1:A:301:ILE:HD12	1.81	0.62
1:A:232:LEU:HD22	1:A:283:ARG:HB2	1.82	0.61
1:A:95:ARG:HB3	1:A:97:GLU:HG2	1.83	0.61
1:A:90:ARG:NH2	1:A:107:GLU:OE1	2.35	0.60
2:B:1953:ILE:HD13	2:B:1982:GLN:HB3	1.83	0.59
2:B:1991:TYR:CE2	2:B:2010:ILE:HD12	2.38	0.59
2:B:1835:GLN:OE1	2:B:1835:GLN:N	2.34	0.58
1:A:71:VAL:HG22	1:A:72:GLY:H	1.69	0.58
1:A:323:PHE:O	1:A:327:THR:HG23	2.05	0.57
2:B:1999:VAL:HB	2:B:2001:SER:H	1.70	0.56
1:A:157:ALA:HB2	3:A:401:HOH:O	2.05	0.56
1:A:15:PHE:HA	1:A:50:MET:HG2	1.87	0.56
1:A:23:ILE:HD12	1:A:23:ILE:O	2.06	0.56
2:B:1949:ARG:HG2	2:B:1986:LEU:HD13	1.87	0.56
1:A:24:LEU:HD23	1:A:46[B]:ARG:HH22	1.70	0.56
1:A:24:LEU:HD23	1:A:46[B]:ARG:NH2	2.22	0.53
1:A:31:GLU:O	1:A:60:TYR:HA	2.08	0.53
2:B:1865[A]:ARG:NH2	3:B:2101:HOH:O	2.34	0.53
2:B:1868:MET:HE3	2:B:1872:LEU:HD22	1.90	0.53
2:B:1782:ASP:O	2:B:1785:VAL:HG13	2.09	0.52
2:B:1991:TYR:HD2	2:B:2010:ILE:HG23	1.73	0.52
1:A:60:TYR:OH	1:A:97:GLU:HB2	2.10	0.52
1:A:278:LEU:HD11	1:A:302:LEU:HD11	1.92	0.51
2:B:1905:LEU:HD21	2:B:1915:VAL:HG21	1.91	0.51
1:A:133:TRP:CZ2	1:A:137:THR:HG21	2.46	0.51
1:A:296:ILE:O	1:A:347:LYS:NZ	2.41	0.51
2:B:1957:ASP:O	2:B:1960:THR:OG1	2.25	0.50
2:B:1782:ASP:OD1	2:B:1865[B]:ARG:NE	2.40	0.50
2:B:2007:ILE:O	2:B:2011:ILE:HG12	2.13	0.49
1:A:23:ILE:HG13	1:A:46[B]:ARG:O	2.13	0.48
2:B:1939:ILE:HG21	2:B:1968:TRP:CZ3	2.47	0.48
1:A:311:ALA:HB2	1:A:359:PHE:CE2	2.48	0.48
1:A:23:ILE:HD13	1:A:26:MET:SD	2.53	0.48
1:A:266:ASN:HB2	3:A:401:HOH:O	2.13	0.48
1:A:135:SER:HB2	1:A:304:HIS:CG	2.48	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:2009:ASP:N	2:B:2009:ASP:OD1	2.46	0.48
2:B:1869:LEU:O	2:B:1873:GLU:HG3	2.13	0.48
1:A:90:ARG:HG2	1:A:99:ASP:HB3	1.96	0.47
1:A:337:SER:HB2	3:A:469:HOH:O	2.14	0.47
1:A:262:PHE:CD1	1:A:271:PHE:HB2	2.49	0.47
2:B:1956:PRO:HG2	2:B:1960:THR:HG21	1.96	0.47
1:A:301:ILE:O	1:A:305:GLN:HG3	2.15	0.46
2:B:1809:ILE:HB	2:B:1818:PHE:HB2	1.98	0.46
1:A:269:GLU:CD	1:A:269:GLU:H	2.22	0.46
1:A:75:MET:HE3	1:A:75:MET:HB3	1.70	0.46
1:A:283:ARG:NH1	1:A:330:VAL:HG21	2.31	0.45
2:B:1782:ASP:OD1	2:B:1865[A]:ARG:HD3	2.16	0.45
1:A:46[A]:ARG:CZ	1:A:118:LEU:HD21	2.46	0.45
2:B:1760:GLU:HG2	2:B:1760:GLU:O	2.17	0.45
2:B:1850:ARG:HG2	2:B:1879:PHE:HZ	1.82	0.45
1:A:342:ALA:O	1:A:346:LYS:HG3	2.16	0.45
2:B:1870:ASP:HB3	2:B:1871:PRO:HD3	1.99	0.44
2:B:1995:ASN:O	2:B:1997:VAL:HG23	2.17	0.44
2:B:1991:TYR:CD2	2:B:2010:ILE:HG23	2.53	0.44
2:B:1892:PRO:HD3	2:B:1941:ARG:NH2	2.32	0.43
1:A:58:LEU:O	1:A:76:GLY:HA2	2.19	0.43
1:A:149:GLN:O	1:A:207:ARG:NH1	2.45	0.42
1:A:133:TRP:CH2	1:A:137:THR:HG21	2.54	0.42
2:B:1783:THR:OG1	2:B:1865[A]:ARG:HD2	2.19	0.42
1:A:311:ALA:HB2	1:A:359:PHE:HE2	1.85	0.41
1:A:252:LEU:HG	1:A:301:ILE:CD1	2.50	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	314/401 (78%)	301 (96%)	13 (4%)	0	100	100
2	B	256/259 (99%)	244 (95%)	12 (5%)	0	100	100
All	All	570/660 (86%)	545 (96%)	25 (4%)	0	100	100

There are no Ramachandran outliers to report.

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	279/352 (79%)	257 (92%)	22 (8%)	11	12
2	B	234/235 (100%)	227 (97%)	7 (3%)	36	48
All	All	513/587 (87%)	484 (94%)	29 (6%)	18	23

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	13	ARG
1	A	14	LEU
1	A	38	SER
1	A	61	SER
1	A	75	MET
1	A	79	LEU
1	A	90	ARG
1	A	93	THR
1	A	114	ASN
1	A	122	LEU
1	A	129	THR
1	A	146	GLU
1	A	155	ILE
1	A	232	LEU
1	A	252	LEU
1	A	264	LEU
1	A	269	GLU
1	A	280	LEU

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Mol	Chain	Res	Type
1	A	296	ILE
1	A	355	LEU
1	A	357	LYS
1	A	361	TRP
2	B	1785	VAL
2	B	1819	LEU
2	B	1872	LEU
2	B	1919	LEU
2	B	1962	THR
2	B	2006	GLU
2	B	2009	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	228	HIS
1	A	304	HIS
1	A	352	GLN
2	B	1791	HIS
2	B	1875	HIS
2	B	1982	GLN
2	B	1998	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

5.7 Other polymers

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 [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, 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	317/401 (79%)	0.24	14 (4%) 39 45	33, 67, 119, 194	3 (0%)
2	B	257/259 (99%)	0.09	7 (2%) 56 63	30, 73, 142, 171	1 (0%)
All	All	574/660 (86%)	0.17	21 (3%) 45 51	30, 70, 136, 194	4 (0%)

All (21) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	10	LEU	4.3
2	B	1999	VAL	3.9
1	A	378	PRO	3.5
1	A	65	LYS	3.3
2	B	2002	LEU	3.3
1	A	158	PHE	3.3
1	A	71	VAL	3.2
1	A	323	PHE	3.1
1	A	66	ALA	3.1
1	A	312	ASP	2.9
2	B	1758	PRO	2.9
1	A	11	ALA	2.8
1	A	324	LEU	2.7
2	B	1997	VAL	2.7
1	A	338	ILE	2.6
1	A	63	VAL	2.5
2	B	2000	ALA	2.3
2	B	2014	MET	2.3
2	B	2012	LEU	2.3
1	A	68	PRO	2.2
1	A	12	LYS	2.1

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.