



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 1, 2026 – 05:28 PM UTC

PDB ID : 3APO / pdb_00003apo
Title : Crystal structure of full-length ERdj5
Authors : Inaba, K.; Suzuki, M.; Nagata, K.
Deposited on : 2010-10-20
Resolution : 2.40 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
Xtrriage (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

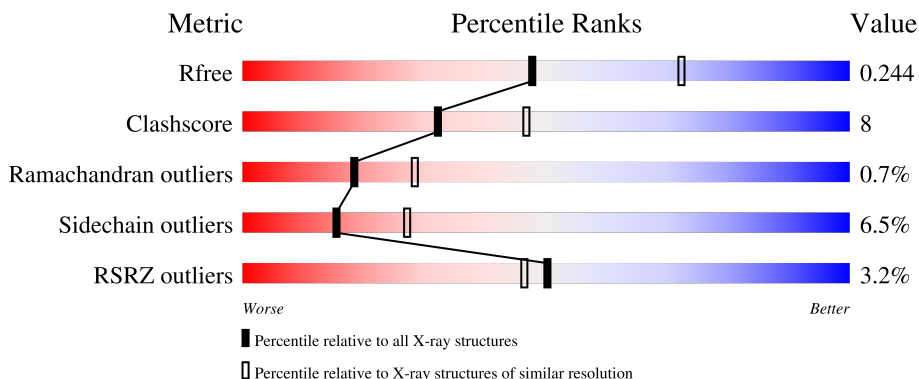
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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	4912 (2.40-2.40)
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (2.40-2.40)

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	780	

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 5768 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 DnaJ homolog subfamily C member 10.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	688	5547	3552	942	1029	24	0	0	0

There are 31 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	14	MET	-	expression tag	UNP Q9DC23
A	15	GLY	-	expression tag	UNP Q9DC23
A	16	SER	-	expression tag	UNP Q9DC23
A	17	SER	-	expression tag	UNP Q9DC23
A	18	HIS	-	expression tag	UNP Q9DC23
A	19	HIS	-	expression tag	UNP Q9DC23
A	20	HIS	-	expression tag	UNP Q9DC23
A	21	HIS	-	expression tag	UNP Q9DC23
A	22	HIS	-	expression tag	UNP Q9DC23
A	23	HIS	-	expression tag	UNP Q9DC23
A	24	SER	-	expression tag	UNP Q9DC23
A	25	SER	-	expression tag	UNP Q9DC23
A	26	GLY	-	expression tag	UNP Q9DC23
A	27	HIS	-	expression tag	UNP Q9DC23
A	28	ILE	-	expression tag	UNP Q9DC23
A	29	GLU	-	expression tag	UNP Q9DC23
A	30	GLY	-	expression tag	UNP Q9DC23
A	31	ARG	-	expression tag	UNP Q9DC23
A	32	HIS	-	expression tag	UNP Q9DC23
A	91	ASP	HIS	engineered mutation	UNP Q9DC23
A	158	SER	CYS	engineered mutation	UNP Q9DC23
A	161	SER	CYS	engineered mutation	UNP Q9DC23
A	399	VAL	GLY	engineered mutation	UNP Q9DC23
A	419	SER	CYS	engineered mutation	UNP Q9DC23
A	480	SER	CYS	engineered mutation	UNP Q9DC23
A	483	SER	CYS	engineered mutation	UNP Q9DC23
A	588	SER	CYS	engineered mutation	UNP Q9DC23

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Chain	Residue	Modelled	Actual	Comment	Reference
A	591	SER	CYS	engineered mutation	UNP Q9DC23
A	617	GLY	GLN	SEE REMARK 999	UNP Q9DC23
A	700	SER	CYS	engineered mutation	UNP Q9DC23
A	703	SER	CYS	engineered mutation	UNP Q9DC23

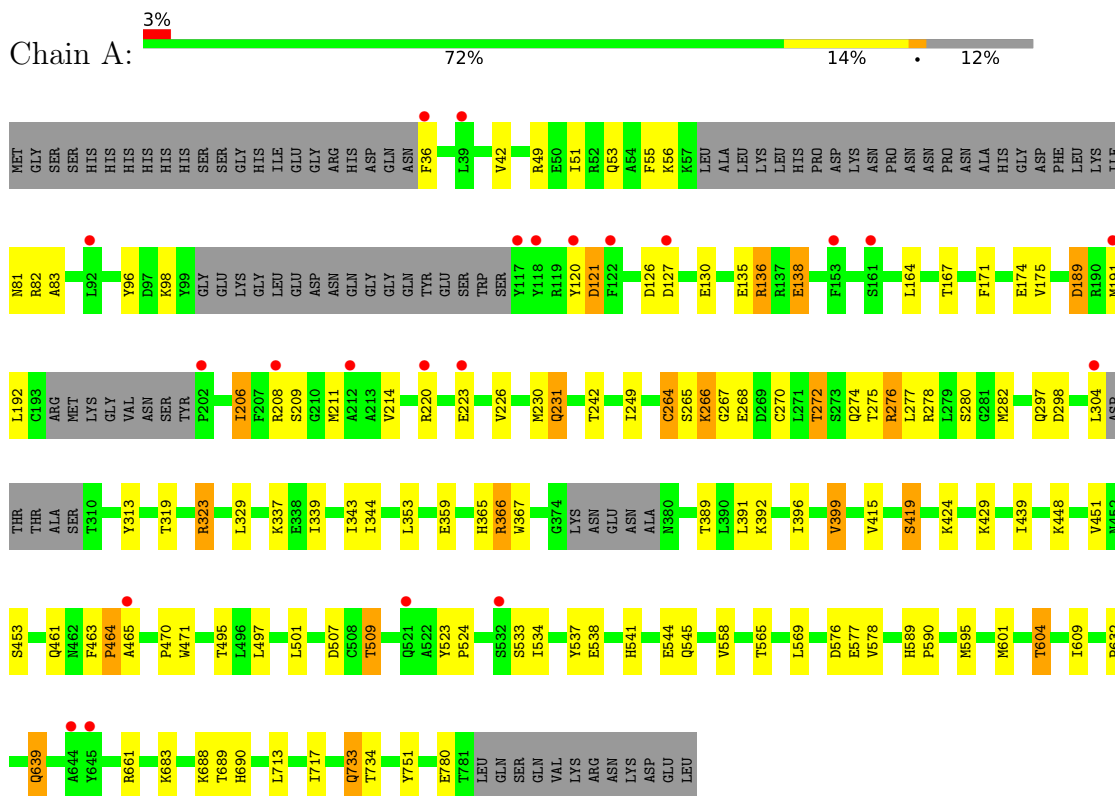
- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	221	Total O 221 221	0	0

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: DnaJ homolog subfamily C member 10



4 Data and refinement statistics i

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	91.10Å 53.40Å 92.30Å 90.00° 113.40° 90.00°	Depositor
Resolution (Å)	45.83 – 2.40 45.83 – 2.40	Depositor EDS
% Data completeness (in resolution range)	99.8 (45.83-2.40) 99.7 (45.83-2.40)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.57 (at 2.39Å)	Xtrriage
Refinement program	REFMAC 5.5.0085	Depositor
R, R_{free}	0.197 , 0.246 0.198 , 0.244	Depositor DCC
R_{free} test set	1627 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å ²)	34.9	Xtrriage
Anisotropy	0.043	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 50.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.013 for l,-k,h	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	5768	wwPDB-VP
Average B, all atoms (Å ²)	47.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.53% 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	0.68	1/5693 (0.0%)	0.92	1/7711 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	558	VAL	CA-CB	5.38	1.59	1.53

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	189	ASP	N-CA-C	5.09	115.74	107.23

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	5547	0	5382	87	0
2	A	221	0	0	4	0
All	All	5768	0	5382	87	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 (87) 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:136:ARG:HH11	1:A:136:ARG:HG2	1.09	1.10
1:A:604:THR:CG2	1:A:661:ARG:HH11	1.76	0.98
1:A:323:ARG:HG3	1:A:323:ARG:HH11	1.28	0.96
1:A:53:GLN:HG2	1:A:126:ASP:HB3	1.57	0.86
1:A:604:THR:HG23	1:A:661:ARG:NH1	1.97	0.80
1:A:276:ARG:HG3	1:A:276:ARG:HH11	1.48	0.78
1:A:136:ARG:HH11	1:A:136:ARG:CG	1.94	0.76
1:A:604:THR:CG2	1:A:661:ARG:NH1	2.48	0.76
1:A:604:THR:HG23	1:A:661:ARG:HH11	1.53	0.73
1:A:604:THR:HG21	1:A:661:ARG:HD2	1.69	0.72
1:A:604:THR:HG22	1:A:661:ARG:HH11	1.54	0.72
1:A:537:TYR:O	2:A:865:HOH:O	2.11	0.69
1:A:226:VAL:O	1:A:230:MET:HG2	1.93	0.68
1:A:272:THR:HG22	1:A:275:THR:H	1.59	0.67
1:A:136:ARG:HG2	1:A:136:ARG:NH1	1.88	0.65
1:A:323:ARG:HG3	1:A:323:ARG:NH1	2.05	0.65
1:A:690:HIS:HD2	1:A:751:TYR:H	1.43	0.64
1:A:231:GLN:HE21	1:A:231:GLN:HA	1.63	0.64
1:A:36:PHE:HB3	1:A:96:TYR:OH	1.99	0.62
1:A:49:ARG:O	1:A:53:GLN:HG3	2.02	0.60
1:A:389:THR:O	1:A:392:LYS:HB2	2.02	0.59
1:A:576:ASP:HA	1:A:639:GLN:HG2	1.84	0.59
1:A:497:LEU:HD13	1:A:501:LEU:HD11	1.87	0.57
1:A:264:CYS:CB	1:A:270:CYS:HG	2.18	0.57
1:A:690:HIS:CD2	1:A:751:TYR:H	2.23	0.56
1:A:36:PHE:CB	1:A:96:TYR:OH	2.56	0.54
1:A:424:LYS:HE2	1:A:453:SER:O	2.08	0.54
1:A:590:PRO:HB2	1:A:632:PRO:HD3	1.90	0.53
1:A:264:CYS:HB3	1:A:270:CYS:HG	1.73	0.53
1:A:264:CYS:SG	1:A:270:CYS:SG	3.04	0.53
1:A:272:THR:CG2	1:A:275:THR:H	2.21	0.53
1:A:604:THR:CG2	1:A:661:ARG:HD2	2.37	0.53
1:A:601:MET:O	1:A:604:THR:HB	2.08	0.52
1:A:276:ARG:HH11	1:A:276:ARG:CG	2.20	0.52
1:A:264:CYS:HB3	1:A:270:CYS:SG	2.50	0.52
1:A:171:PHE:O	1:A:175:VAL:HG22	2.10	0.52
1:A:164:LEU:HD13	1:A:220:ARG:HD2	1.92	0.51
1:A:272:THR:HG23	1:A:274:GLN:H	1.74	0.51
1:A:396:ILE:HD11	1:A:451:VAL:HG21	1.93	0.51
1:A:366:ARG:HD3	2:A:824:HOH:O	2.11	0.51
1:A:206:ILE:HG22	1:A:214:VAL:HB	1.94	0.49
1:A:463:PHE:O	1:A:465:ALA:N	2.43	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:733:GLN:HE21	1:A:734:THR:N	2.11	0.49
1:A:359:GLU:HB3	2:A:962:HOH:O	2.12	0.48
1:A:688:LYS:HG2	1:A:751:TYR:CZ	2.49	0.48
1:A:464:PRO:HB3	1:A:471:TRP:CE2	2.49	0.48
1:A:507:ASP:OD1	1:A:509:THR:HB	2.13	0.47
1:A:733:GLN:HE21	1:A:734:THR:H	1.62	0.47
1:A:266:LYS:C	1:A:268:GLU:H	2.22	0.47
1:A:537:TYR:OH	1:A:545:GLN:HB2	2.15	0.47
1:A:353:LEU:HD11	1:A:399:VAL:HG21	1.97	0.47
1:A:533:SER:C	1:A:534:ILE:HG13	2.40	0.47
1:A:391:LEU:HD23	1:A:448:LYS:HE3	1.97	0.47
1:A:277:LEU:O	1:A:280:SER:HB3	2.16	0.46
1:A:470:PRO:HB2	1:A:501:LEU:HB3	1.98	0.46
1:A:578:VAL:HG23	1:A:609:ILE:HG23	1.98	0.46
1:A:276:ARG:HG3	1:A:276:ARG:NH1	2.25	0.45
1:A:415:VAL:HG13	1:A:419:SER:OG	2.17	0.45
1:A:313:TYR:HB3	1:A:329:LEU:HB3	1.98	0.45
1:A:266:LYS:HA	1:A:266:LYS:HD2	1.64	0.45
1:A:136:ARG:CG	1:A:136:ARG:NH1	2.63	0.45
1:A:49:ARG:HG2	1:A:53:GLN:NE2	2.30	0.45
1:A:174:GLU:OE2	1:A:278:ARG:NH1	2.42	0.44
1:A:278:ARG:O	1:A:282:MET:HG3	2.18	0.44
1:A:81:ASN:O	1:A:83:ALA:N	2.51	0.43
1:A:589:HIS:N	1:A:590:PRO:HD2	2.33	0.43
1:A:266:LYS:HE3	1:A:267:GLY:H	1.83	0.43
1:A:53:GLN:CG	1:A:126:ASP:HB3	2.36	0.43
1:A:189:ASP:OD1	1:A:191:MET:HB3	2.18	0.43
1:A:276:ARG:CG	1:A:276:ARG:NH1	2.81	0.43
1:A:272:THR:HG23	1:A:274:GLN:N	2.34	0.43
1:A:565:THR:O	1:A:569:LEU:HB2	2.19	0.42
1:A:138:GLU:H	1:A:138:GLU:HG3	1.73	0.42
1:A:365:HIS:HB2	1:A:367:TRP:HE1	1.85	0.42
1:A:120:TYR:O	1:A:121:ASP:HB2	2.19	0.42
1:A:265:SER:O	1:A:268:GLU:HB2	2.18	0.42
1:A:49:ARG:HG2	1:A:53:GLN:HE21	1.85	0.42
1:A:683:LYS:NZ	2:A:809:HOH:O	2.52	0.42
1:A:42:VAL:HG21	1:A:51:ILE:HD13	2.01	0.42
1:A:242:THR:OG1	1:A:297:GLN:NE2	2.43	0.42
1:A:453:SER:HA	1:A:495:THR:HG22	2.02	0.42
1:A:713:LEU:O	1:A:717:ILE:HG12	2.19	0.41
1:A:523:TYR:HA	1:A:524:PRO:HA	1.93	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:55:PHE:HE1	1:A:81:ASN:HA	1.86	0.40
1:A:339:ILE:O	1:A:343:ILE:HG12	2.21	0.40
1:A:429:LYS:HA	1:A:429:LYS:HD3	1.81	0.40
1:A:249:ILE:HD13	1:A:249:ILE:HA	1.94	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	676/780 (87%)	653 (97%)	18 (3%)	5 (1%)	18 28

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	82	ARG
1	A	121	ASP
1	A	541	HIS
1	A	56	LYS
1	A	464	PRO

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	602/681 (88%)	563 (94%)	39 (6%)	15 27

All (39) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	98	LYS
1	A	127	ASP
1	A	130	GLU
1	A	135	GLU
1	A	136	ARG
1	A	138	GLU
1	A	167	THR
1	A	192	LEU
1	A	206	ILE
1	A	208	ARG
1	A	209	SER
1	A	211	MET
1	A	223	GLU
1	A	231	GLN
1	A	264	CYS
1	A	266	LYS
1	A	272	THR
1	A	276	ARG
1	A	298	ASP
1	A	304	LEU
1	A	319	THR
1	A	323	ARG
1	A	337	LYS
1	A	344	ILE
1	A	366	ARG
1	A	399	VAL
1	A	419	SER
1	A	439	ILE
1	A	461	GLN
1	A	509	THR
1	A	538	GLU
1	A	544	GLU
1	A	577	GLU
1	A	595	MET
1	A	604	THR
1	A	639	GLN
1	A	689	THR
1	A	733	GLN

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Mol	Chain	Res	Type
1	A	780	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	53	GLN
1	A	231	GLN
1	A	297	GLN
1	A	380	ASN
1	A	530	ASN
1	A	541	HIS
1	A	572	GLN
1	A	610	ASN
1	A	618	GLN
1	A	654	ASN
1	A	681	ASN
1	A	686	GLN
1	A	690	HIS
1	A	705	ASN
1	A	729	GLN
1	A	733	GLN
1	A	762	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 [i](#)

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	688/780 (88%)	0.05	22 (3%) 50 46	22, 41, 87, 119	3 (0%)

All (22) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	202	PRO	5.0
1	A	118	TYR	3.8
1	A	208	ARG	3.6
1	A	120	TYR	3.6
1	A	117	TYR	3.4
1	A	644	ALA	3.1
1	A	39	LEU	2.6
1	A	532	SER	2.6
1	A	36	PHE	2.6
1	A	304	LEU	2.5
1	A	521	GLN	2.5
1	A	465	ALA	2.3
1	A	92	LEU	2.2
1	A	127	ASP	2.2
1	A	122	PHE	2.2
1	A	220	ARG	2.2
1	A	223	GLU	2.1
1	A	645	TYR	2.1
1	A	191	MET	2.1
1	A	212	ALA	2.0
1	A	153	PHE	2.0
1	A	161	SER	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.