



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 27, 2024 – 03:01 PM JST

PDB ID : 8WWF
Title : Crystal structure of (R)-DHPS dehydrogenase HpsO from Ruegeria pomeroyi DSS-3
Authors : Liu, L.; Tang, K.
Deposited on : 2023-10-25
Resolution : 1.70 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 : 3.0
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.002 (Gargrove)
Density-Fitness : 1.0.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.38.2

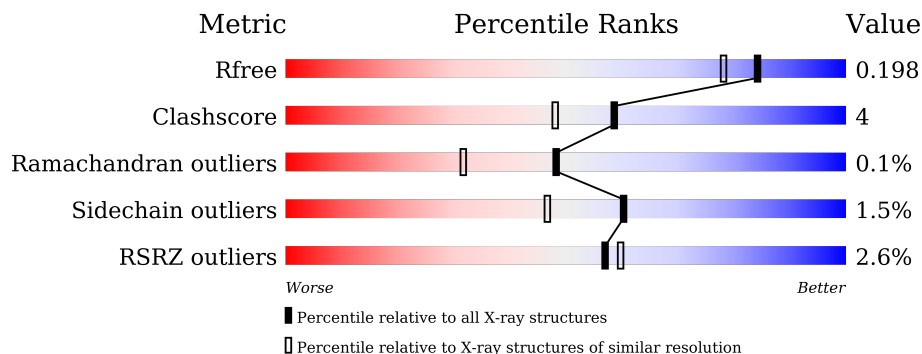
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.70 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}	164625	5161 (1.70-1.70)
Clashscore	180529	5671 (1.70-1.70)
Ramachandran outliers	177936	5594 (1.70-1.70)
Sidechain outliers	177891	5594 (1.70-1.70)
RSRZ outliers	164620	5159 (1.70-1.70)

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	253	 3% 85% 12% ..
1	B	253	 3% 88% 9% ..
1	C	253	 3% 91% 6% ..
1	D	253	 2% 89% 10% ..

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 8483 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 (R)-DHPS dehydrogenase HpsO.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	249	Total 1834	C 1152	N 330	O 345	S 7	0	0	0
1	B	249	Total 1834	C 1152	N 330	O 345	S 7	0	0	0
1	C	249	Total 1834	C 1152	N 330	O 345	S 7	0	0	0
1	D	253	Total 1861	C 1167	N 334	O 352	S 8	0	0	0

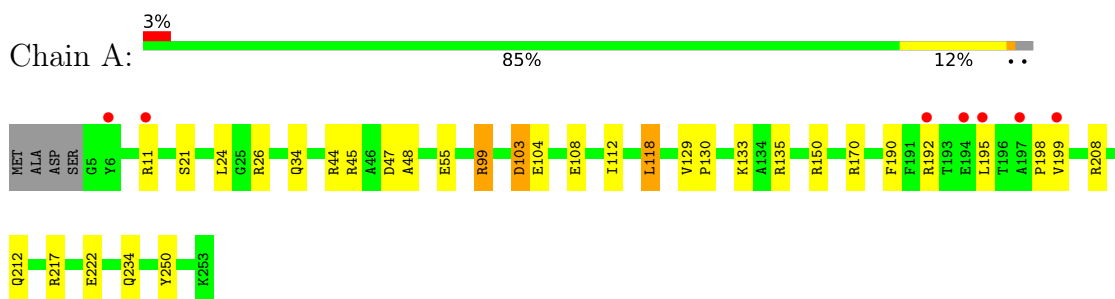
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	270	Total 270	O 270	0	0
2	B	271	Total 271	O 271	0	0
2	C	283	Total 283	O 283	0	0
2	D	296	Total 296	O 296	0	0

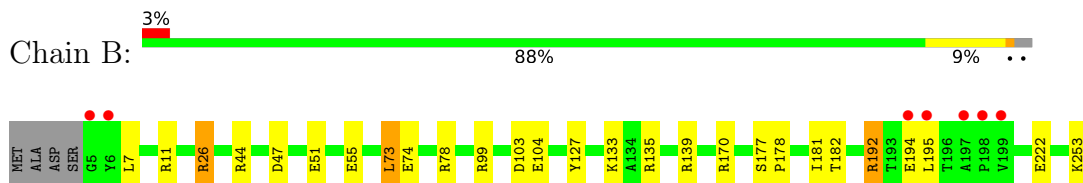
3 Residue-property plots [i](#)

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.

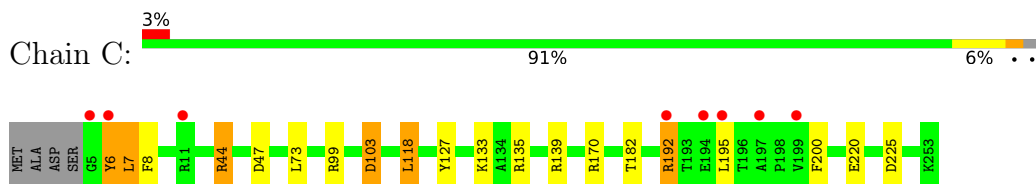
- Molecule 1: (R)-DHPS dehydrogenase HpsO



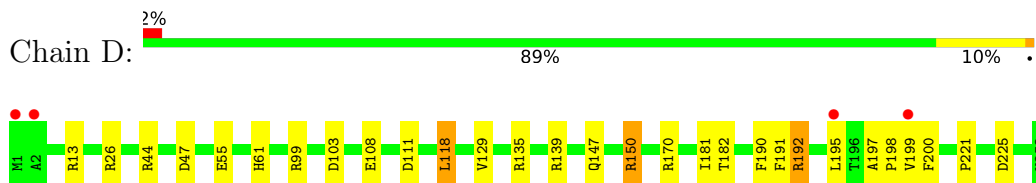
- Molecule 1: (R)-DHPS dehydrogenase HpsO



- Molecule 1: (R)-DHPS dehydrogenase HpsO



- Molecule 1: (R)-DHPS dehydrogenase HpsO



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	56.14Å 56.16Å 76.19Å 96.27° 105.96° 90.70°	Depositor
Resolution (Å)	41.95 – 1.70 41.95 – 1.70	Depositor EDS
% Data completeness (in resolution range)	95.7 (41.95-1.70) 95.7 (41.95-1.70)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.98 (at 1.70Å)	Xtrriage
Refinement program	REFMAC 5.7.0032	Depositor
R, R_{free}	0.157 , 0.194 0.168 , 0.198	Depositor DCC
R_{free} test set	4880 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	16.3	Xtrriage
Anisotropy	0.036	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 46.9	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	0.96	EDS
Total number of atoms	8483	wwPDB-VP
Average B, all atoms (Å ²)	19.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.87% 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	1.14	4/1874 (0.2%)	1.41	12/2552 (0.5%)
1	B	1.12	3/1874 (0.2%)	1.38	10/2552 (0.4%)
1	C	1.13	2/1874 (0.1%)	1.40	9/2552 (0.4%)
1	D	1.13	4/1901 (0.2%)	1.42	10/2588 (0.4%)
All	All	1.13	13/7523 (0.2%)	1.40	41/10244 (0.4%)

All (13) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	170	ARG	CZ-NH1	8.71	1.44	1.33
1	D	170	ARG	CZ-NH2	-8.24	1.22	1.33
1	A	170	ARG	CZ-NH2	-7.88	1.22	1.33
1	C	170	ARG	CZ-NH1	7.75	1.43	1.33
1	D	170	ARG	CZ-NH1	7.27	1.42	1.33
1	C	170	ARG	CZ-NH2	-6.94	1.24	1.33
1	B	170	ARG	CZ-NH2	-6.37	1.24	1.33
1	D	108	GLU	CD-OE1	-6.05	1.19	1.25
1	D	150	ARG	CZ-NH2	-5.36	1.26	1.33
1	B	170	ARG	CZ-NH1	5.34	1.40	1.33
1	B	170	ARG	CD-NE	-5.21	1.37	1.46
1	A	234	GLN	CG-CD	5.09	1.62	1.51
1	A	108	GLU	CD-OE1	-5.02	1.20	1.25

All (41) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	170	ARG	NE-CZ-NH2	-34.02	103.29	120.30
1	A	170	ARG	NE-CZ-NH2	-33.84	103.38	120.30
1	B	170	ARG	NE-CZ-NH2	-33.45	103.58	120.30
1	C	170	ARG	NE-CZ-NH2	-33.37	103.62	120.30
1	D	170	ARG	NE-CZ-NH1	31.44	136.02	120.30
1	C	170	ARG	NE-CZ-NH1	30.80	135.70	120.30
1	A	170	ARG	NE-CZ-NH1	29.58	135.09	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	170	ARG	NE-CZ-NH1	28.55	134.58	120.30
1	C	44	ARG	NE-CZ-NH2	-8.74	115.93	120.30
1	D	170	ARG	CD-NE-CZ	8.49	135.49	123.60
1	C	170	ARG	CD-NE-CZ	8.31	135.24	123.60
1	A	170	ARG	CD-NE-CZ	7.02	133.43	123.60
1	D	118	LEU	CB-CG-CD2	7.00	122.90	111.00
1	B	170	ARG	CD-NE-CZ	6.99	133.38	123.60
1	A	208	ARG	NE-CZ-NH1	6.57	123.59	120.30
1	B	26	ARG	NE-CZ-NH2	-6.57	117.02	120.30
1	A	208	ARG	NE-CZ-NH2	-6.55	117.02	120.30
1	B	103	ASP	CB-CG-OD2	-6.32	112.62	118.30
1	D	150	ARG	NE-CZ-NH2	-6.28	117.16	120.30
1	A	99	ARG	NE-CZ-NH2	-6.12	117.24	120.30
1	A	150	ARG	NE-CZ-NH2	-6.04	117.28	120.30
1	D	47	ASP	CB-CG-OD1	5.88	123.59	118.30
1	D	225	ASP	CB-CG-OD2	-5.71	113.16	118.30
1	B	104	GLU	OE1-CD-OE2	-5.68	116.48	123.30
1	A	118	LEU	CB-CG-CD2	5.67	120.63	111.00
1	D	225	ASP	CB-CG-OD1	5.62	123.36	118.30
1	A	24	LEU	CB-CG-CD2	-5.58	101.51	111.00
1	D	111	ASP	CB-CG-OD1	5.57	123.31	118.30
1	C	118	LEU	CB-CG-CD2	5.57	120.47	111.00
1	C	44	ARG	NE-CZ-NH1	5.56	123.08	120.30
1	B	44	ARG	NE-CZ-NH2	-5.50	117.55	120.30
1	C	103	ASP	CB-CG-OD2	-5.49	113.36	118.30
1	B	11	ARG	CG-CD-NE	-5.41	100.44	111.80
1	D	44	ARG	NE-CZ-NH2	-5.39	117.61	120.30
1	A	104	GLU	OE1-CD-OE2	-5.35	116.88	123.30
1	A	217	ARG	NE-CZ-NH2	5.35	122.97	120.30
1	B	26	ARG	NE-CZ-NH1	5.20	122.90	120.30
1	C	47	ASP	CB-CG-OD1	5.20	122.98	118.30
1	A	103	ASP	CB-CG-OD2	-5.11	113.70	118.30
1	C	225	ASP	CB-CG-OD1	5.06	122.86	118.30
1	B	253	LYS	CA-C-O	-5.00	109.59	120.10

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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	1834	0	1796	16	0
1	B	1834	0	1796	17	0
1	C	1834	0	1796	13	0
1	D	1861	0	1822	20	0
2	A	270	0	0	6	1
2	B	271	0	0	9	1
2	C	283	0	0	4	0
2	D	296	0	0	9	0
All	All	8483	0	7210	63	1

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 (63) 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:222:GLU:OE1	2:B:301:HOH:O	1.63	1.14
1:A:222:GLU:OE1	2:A:301:HOH:O	1.88	0.92
1:B:192:ARG:NH2	2:B:304:HOH:O	2.08	0.85
1:B:194:GLU:OE2	2:B:302:HOH:O	1.95	0.85
1:C:99:ARG:NH1	1:C:195:LEU:O	2.12	0.82
1:B:74:GLU:OE1	2:B:303:HOH:O	2.04	0.75
1:C:220:GLU:HG3	2:C:533:HOH:O	1.87	0.74
1:C:6:TYR:O	1:C:8:PHE:N	2.13	0.73
1:D:135:ARG:NH1	2:D:304:HOH:O	2.21	0.73
1:B:99:ARG:NH1	1:B:195:LEU:O	2.26	0.69
1:A:198:PRO:O	2:A:302:HOH:O	2.11	0.69
1:B:47:ASP:O	1:B:51:GLU:HG3	1.93	0.68
1:B:26:ARG:HH21	1:B:55:GLU:CD	1.98	0.66
1:A:99:ARG:NH1	1:A:195:LEU:O	2.28	0.66
1:D:26:ARG:HH21	1:D:55:GLU:CD	2.01	0.63
1:A:26:ARG:HH21	1:A:55:GLU:CD	2.02	0.62
1:C:6:TYR:C	1:C:8:PHE:H	2.02	0.61
1:D:192:ARG:NH2	2:D:306:HOH:O	2.32	0.61
1:A:192:ARG:NH2	2:A:305:HOH:O	2.33	0.60
1:C:6:TYR:CD2	1:C:7:LEU:N	2.67	0.60
1:B:135:ARG:NH1	2:B:309:HOH:O	2.35	0.59
1:B:135:ARG:NH1	2:B:308:HOH:O	2.30	0.58
1:A:103:ASP:OD2	1:C:133:LYS:NZ	2.40	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:13:ARG:NH2	2:D:303:HOH:O	2.11	0.54
1:D:191:PHE:HB3	2:D:434:HOH:O	2.08	0.53
1:D:26:ARG:NH2	1:D:55:GLU:OE2	2.42	0.50
1:D:139:ARG:HD3	1:D:182:THR:OG1	2.11	0.50
1:A:45:ARG:NH2	1:A:47:ASP:OD2	2.44	0.50
1:C:192:ARG:HG2	1:C:200:PHE:CE1	2.47	0.50
1:B:47:ASP:OD2	2:B:305:HOH:O	2.18	0.49
1:D:190:PHE:CE1	1:D:199:VAL:HG21	2.47	0.49
1:A:190:PHE:CE1	1:A:199:VAL:HG21	2.48	0.48
1:B:73:LEU:HB3	1:B:127:TYR:HE2	1.78	0.48
1:B:78:ARG:NH2	2:B:306:HOH:O	2.29	0.48
1:B:133:LYS:NZ	1:D:103:ASP:OD2	2.47	0.47
1:D:192:ARG:NH1	2:D:306:HOH:O	2.46	0.47
1:A:135:ARG:HD2	2:A:422:HOH:O	2.14	0.47
1:D:197:ALA:HB3	1:D:198:PRO:HD3	1.95	0.47
1:A:34:GLN:NE2	2:A:306:HOH:O	2.38	0.46
1:D:129:VAL:HG13	1:D:181:ILE:HD13	1.97	0.46
1:A:11:ARG:NH2	2:A:309:HOH:O	2.46	0.46
1:D:13:ARG:NE	2:D:303:HOH:O	2.46	0.45
1:D:129:VAL:HG13	1:D:181:ILE:CD1	2.47	0.45
1:C:44:ARG:HD3	2:C:303:HOH:O	2.17	0.45
1:C:44:ARG:CD	2:C:303:HOH:O	2.65	0.45
1:C:139:ARG:HD3	1:C:182:THR:OG1	2.17	0.45
1:D:147:GLN:HA	1:D:150:ARG:O	2.17	0.44
1:D:99:ARG:NH1	1:D:195:LEU:O	2.52	0.43
1:D:61:HIS:HD2	2:D:516:HOH:O	2.01	0.43
1:D:26:ARG:HD3	2:D:463:HOH:O	2.18	0.42
1:B:135:ARG:NH2	2:B:308:HOH:O	2.52	0.42
1:A:21:SER:HB2	1:A:48:ALA:HB1	2.01	0.42
1:A:129:VAL:N	1:A:130:PRO:CD	2.82	0.42
1:B:139:ARG:HD3	1:B:182:THR:OG1	2.18	0.42
1:B:177:SER:N	1:B:178:PRO:CD	2.83	0.41
1:D:192:ARG:HG2	1:D:200:PHE:CE1	2.56	0.41
1:A:112:ILE:HD12	1:A:112:ILE:HA	1.89	0.41
1:B:177:SER:HA	1:B:181:ILE:O	2.21	0.41
1:A:212:GLN:HG2	1:A:250:TYR:CZ	2.56	0.41
1:C:73:LEU:HB3	1:C:127:TYR:HE2	1.86	0.41
1:A:133:LYS:NZ	1:C:103:ASP:OD2	2.54	0.40
1:C:135:ARG:NH1	2:C:316:HOH:O	2.53	0.40
1:D:99:ARG:NH2	2:D:325:HOH:O	2.53	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the sym-

metry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:476:HOH:O	2:B:533:HOH:O[1_565]	2.10	0.10

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	247/253 (98%)	240 (97%)	7 (3%)	0	100	100
1	B	247/253 (98%)	242 (98%)	5 (2%)	0	100	100
1	C	247/253 (98%)	238 (96%)	8 (3%)	1 (0%)	30	17
1	D	251/253 (99%)	244 (97%)	7 (3%)	0	100	100
All	All	992/1012 (98%)	964 (97%)	27 (3%)	1 (0%)	48	32

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	7	LEU

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	179/182 (98%)	177 (99%)	2 (1%)	70	60
1	B	179/182 (98%)	176 (98%)	3 (2%)	56	41
1	C	179/182 (98%)	176 (98%)	3 (2%)	56	41

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	D	182/182 (100%)	179 (98%)	3 (2%)	58 44
All	All	719/728 (99%)	708 (98%)	11 (2%)	60 47

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	44	ARG
1	A	118	LEU
1	B	7	LEU
1	B	73	LEU
1	B	192	ARG
1	C	6	TYR
1	C	118	LEU
1	C	192	ARG
1	D	118	LEU
1	D	192	ARG
1	D	221	PRO

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	D	61	HIS
1	D	79	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

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	249/253 (98%)	-0.04	7 (2%) 55 58	9, 16, 35, 49	0
1	B	249/253 (98%)	-0.10	7 (2%) 55 58	9, 15, 35, 49	0
1	C	249/253 (98%)	-0.08	8 (3%) 50 53	9, 15, 35, 53	0
1	D	253/253 (100%)	-0.11	4 (1%) 70 73	9, 15, 34, 44	0
All	All	1000/1012 (98%)	-0.08	26 (2%) 57 60	9, 15, 35, 53	0

All (26) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	199	VAL	6.0
1	C	6	TYR	5.4
1	B	6	TYR	4.8
1	C	199	VAL	4.7
1	A	195	LEU	4.6
1	A	11	ARG	4.3
1	C	5	GLY	4.3
1	A	199	VAL	4.2
1	B	195	LEU	4.2
1	A	6	TYR	4.1
1	D	195	LEU	3.7
1	B	197	ALA	3.3
1	A	197	ALA	3.0
1	C	195	LEU	3.0
1	D	199	VAL	3.0
1	D	2	ALA	2.9
1	C	192	ARG	2.7
1	A	192	ARG	2.5
1	A	194	GLU	2.5
1	B	198	PRO	2.4
1	B	194	GLU	2.4

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Mol	Chain	Res	Type	RSRZ
1	C	194	GLU	2.3
1	C	11	ARG	2.3
1	B	5	GLY	2.1
1	D	1	MET	2.1
1	C	197	ALA	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](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.