



# Full wwPDB X-ray Structure Validation Report ⓘ

Jul 3, 2026 – 01:03 AM JST

PDB ID : 9W5P / pdb\_00009w5p  
Title : Crystal structure of KRED  
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Deposited on : 2025-08-01  
Resolution : 2.53 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](mailto: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>.

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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 : 9.0.015 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.50

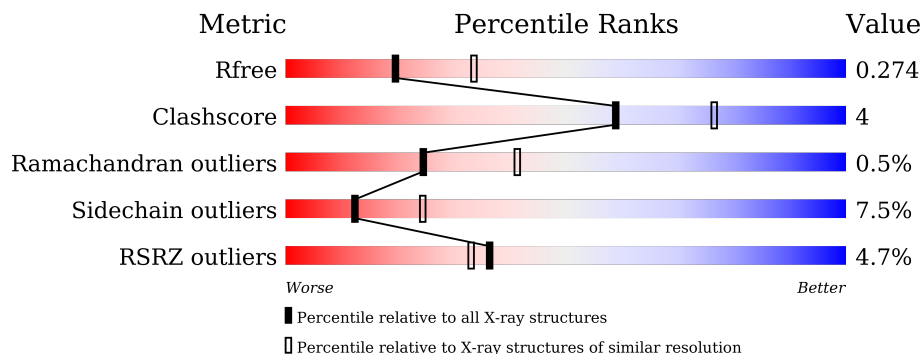
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.53 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	7383 (2.54-2.50)
Clashscore	190562	8079 (2.54-2.50)
Ramachandran outliers	187476	7944 (2.54-2.50)
Sidechain outliers	187428	7946 (2.54-2.50)
RSRZ outliers	180081	7387 (2.54-2.50)

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  $\geq 3$ , 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	259	 7% 82% 17%
1	B	259	 2% 86% 13% .
1	C	259	 6% 82% 17% .
1	D	259	 4% 81% 17% ..

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 7453 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 Short-chain dehydrogenase/reductase SDR.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	258	1863	1167	326	356	14	0	0	0
1	B	258	1867	1170	327	356	14	0	0	0
1	C	258	1867	1170	327	356	14	0	0	0
1	D	256	1852	1160	325	353	14	0	0	0

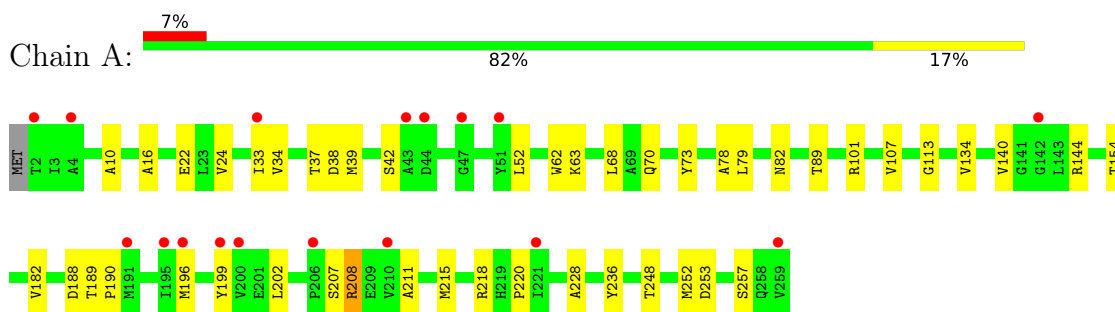
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	1	Total 1	O 1	0	0
2	C	1	Total 1	O 1	0	0
2	D	2	Total 2	O 2	0	0

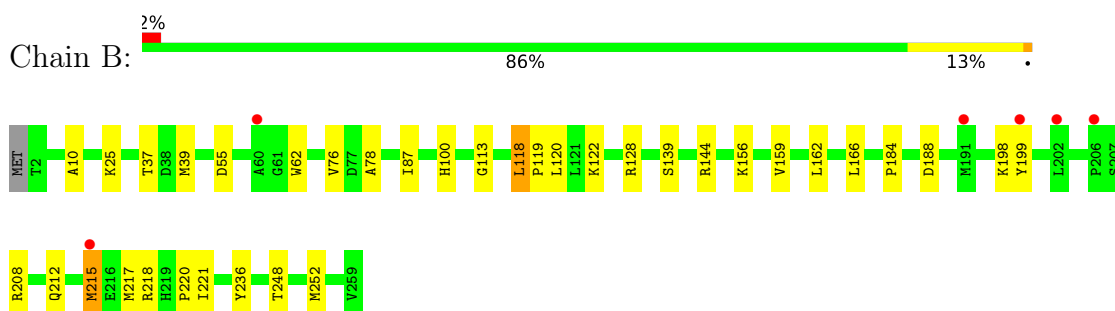
### 3 Residue-property plots [i](#)

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.

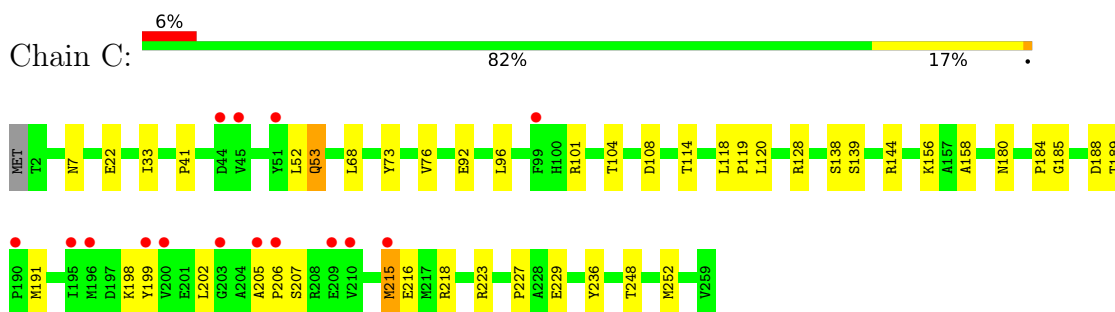
- Molecule 1: Short-chain dehydrogenase/reductase SDR



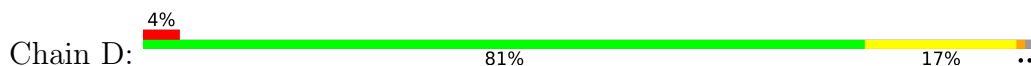
- Molecule 1: Short-chain dehydrogenase/reductase SDR

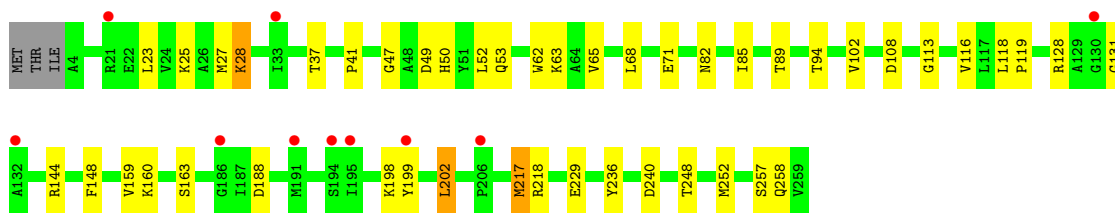


- Molecule 1: Short-chain dehydrogenase/reductase SDR



- Molecule 1: Short-chain dehydrogenase/reductase SDR





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	66.45Å 121.88Å 143.28Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	71.74 – 2.53 71.74 – 2.53	Depositor EDS
% Data completeness (in resolution range)	99.2 (71.74-2.53) 99.2 (71.74-2.53)	Depositor EDS
$R_{merge}$	0.21	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.89 (at 2.51Å)	Xtrriage
Refinement program	REFMAC 5.8.0258	Depositor
R, $R_{free}$	0.212 , 0.275 0.216 , 0.274	Depositor DCC
$R_{free}$ test set	2002 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	46.0	Xtrriage
Anisotropy	0.765	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 37.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	7453	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	58.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.15% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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	1/1892 (0.1%)	1.56	1/2563 (0.0%)
1	B	1.12	0/1896	1.54	2/2567 (0.1%)
1	C	1.12	0/1896	1.55	5/2567 (0.2%)
1	D	1.12	0/1881	1.52	5/2546 (0.2%)
All	All	1.12	1/7565 (0.0%)	1.54	13/10243 (0.1%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	220	PRO	C-O	-6.17	1.16	1.24

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	92	GLU	CB-CA-C	-6.12	100.58	110.74
1	D	94	THR	CB-CA-C	6.07	116.18	110.17
1	D	25	LYS	CA-C-N	5.74	128.28	120.54
1	D	25	LYS	C-N-CA	5.74	128.28	120.54
1	B	159	VAL	CA-C-N	5.72	127.88	120.44
1	B	159	VAL	C-N-CA	5.72	127.88	120.44
1	A	107	VAL	CA-C-O	-5.65	115.77	120.80
1	C	96	LEU	CA-C-N	5.16	127.19	120.28
1	C	96	LEU	C-N-CA	5.16	127.19	120.28
1	D	131	GLY	CA-C-O	-5.10	117.88	122.57
1	C	114	THR	N-CA-C	-5.09	105.82	111.36
1	C	185	GLY	CA-C-O	-5.09	116.35	121.64
1	D	202	LEU	N-CA-C	-5.08	107.08	113.28

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	1863	0	1862	17	0
1	B	1867	0	1873	16	0
1	C	1867	0	1873	21	0
1	D	1852	0	1855	21	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	2	0	0	0	0
All	All	7453	0	7463	65	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 4.

All (65) 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:22:GLU:HG2	1:A:228:ALA:HA	1.46	0.98
1:A:24:VAL:HG13	1:A:34:VAL:HG11	1.69	0.74
1:A:22:GLU:HG2	1:A:228:ALA:CA	2.23	0.67
1:C:41:PRO:HA	1:C:53:GLN:HG3	1.80	0.61
1:C:236:TYR:OH	1:D:252:MET:HE3	2.03	0.59
1:D:257:SER:OG	1:D:258:GLN:NE2	2.21	0.58
1:B:144:ARG:CZ	1:C:144:ARG:HH21	2.19	0.56
1:A:252:MET:HE3	1:B:236:TYR:OH	2.06	0.54
1:D:49:ASP:O	1:D:50:HIS:CG	2.61	0.54
1:D:41:PRO:HA	1:D:53:GLN:OE1	2.07	0.54
1:C:215:MET:HG3	1:C:216:GLU:N	2.23	0.53
1:A:140:VAL:HG11	1:A:253:ASP:HB2	1.91	0.53
1:B:118:LEU:HB3	1:B:119:PRO:HD3	1.90	0.52
1:C:118:LEU:HB3	1:C:119:PRO:HD3	1.92	0.52
1:B:100:HIS:NE2	1:D:108:ASP:OD2	2.44	0.51
1:C:180:ASN:OD1	1:C:248:THR:HG22	2.11	0.51
1:A:144:ARG:NH2	1:A:257:SER:O	2.44	0.49
1:D:52:LEU:HD11	1:D:68:LEU:HD22	1.94	0.49
1:A:154:THR:CG2	1:C:158:ALA:HB1	2.43	0.48
1:D:82:ASN:O	1:D:82:ASN:CG	2.56	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:10:ALA:HA	1:B:78:ALA:O	2.14	0.48
1:D:49:ASP:O	1:D:50:HIS:CD2	2.66	0.48
1:A:189:THR:HB	1:A:190:PRO:HD2	1.96	0.47
1:B:215:MET:HB3	1:B:215:MET:HE3	1.65	0.47
1:A:144:ARG:CZ	1:D:144:ARG:NH1	2.78	0.47
1:C:104:THR:HA	1:C:108:ASP:HB2	1.96	0.47
1:D:62:TRP:CD2	1:D:113:GLY:HA2	2.51	0.46
1:B:62:TRP:CD2	1:B:113:GLY:HA2	2.51	0.46
1:C:22:GLU:HG3	1:C:227:PRO:HB2	1.97	0.46
1:B:144:ARG:CZ	1:C:144:ARG:NH2	2.78	0.46
1:C:33:ILE:HG21	1:C:73:TYR:CE1	2.51	0.46
1:D:28:LYS:HG3	1:D:47:GLY:O	2.16	0.46
1:A:79:LEU:O	1:A:134:VAL:HA	2.15	0.45
1:C:215:MET:HE2	1:C:215:MET:HB2	1.83	0.45
1:D:23:LEU:O	1:D:27:MET:HG3	2.16	0.45
1:D:85:ILE:HD11	1:D:102:VAL:HA	1.99	0.45
1:B:156:LYS:HD2	1:B:156:LYS:HA	1.72	0.45
1:C:223:ARG:HH22	1:C:229:GLU:CD	2.24	0.45
1:D:159:VAL:O	1:D:160:LYS:C	2.60	0.45
1:B:76:VAL:HG23	1:B:120:LEU:HB3	1.98	0.44
1:C:252:MET:HE3	1:D:236:TYR:OH	2.17	0.44
1:A:10:ALA:HA	1:A:78:ALA:O	2.18	0.44
1:D:118:LEU:HB3	1:D:119:PRO:HD3	1.98	0.43
1:A:236:TYR:OH	1:B:252:MET:HE3	2.19	0.43
1:B:118:LEU:O	1:B:122:LYS:HG3	2.18	0.43
1:C:76:VAL:HG23	1:C:120:LEU:HB3	2.00	0.43
1:B:139:SER:HA	1:B:184:PRO:HD2	2.01	0.43
1:A:33:ILE:HG21	1:A:73:TYR:CZ	2.54	0.43
1:C:139:SER:HA	1:C:184:PRO:HD2	2.00	0.43
1:D:160:LYS:O	1:D:163:SER:HB2	2.18	0.43
1:A:16:ALA:HB3	1:A:38:ASP:OD2	2.19	0.43
1:C:205:ALA:HA	1:C:206:PRO:HD3	1.91	0.42
1:D:52:LEU:HD22	1:D:65:VAL:HG22	2.01	0.42
1:A:208:ARG:O	1:A:211:ALA:HB3	2.20	0.42
1:B:162:LEU:O	1:B:166:LEU:HG	2.19	0.42
1:D:89:THR:O	1:D:148:PHE:HA	2.20	0.42
1:A:62:TRP:CD2	1:A:113:GLY:HA2	2.55	0.42
1:C:138:SER:HA	1:C:156:LYS:HD2	2.00	0.41
1:C:33:ILE:HG21	1:C:73:TYR:CZ	2.55	0.41
1:D:217:MET:HE2	1:D:217:MET:HB2	1.96	0.41
1:B:144:ARG:NH2	1:C:144:ARG:NH2	2.68	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:52:LEU:HD11	1:A:68:LEU:HD22	2.03	0.41
1:B:55:ASP:OD1	1:B:55:ASP:C	2.63	0.41
1:D:229:GLU:O	1:D:252:MET:HE2	2.21	0.41
1:C:52:LEU:HD21	1:C:68:LEU:HD22	2.02	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	256/259 (99%)	242 (94%)	13 (5%)	1 (0%)	30	47
1	B	256/259 (99%)	246 (96%)	9 (4%)	1 (0%)	30	47
1	C	256/259 (99%)	240 (94%)	14 (6%)	2 (1%)	16	29
1	D	254/259 (98%)	240 (94%)	13 (5%)	1 (0%)	30	47
All	All	1022/1036 (99%)	968 (95%)	49 (5%)	5 (0%)	24	41

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	188	ASP
1	C	207	SER
1	D	188	ASP
1	A	188	ASP
1	C	188	ASP

### 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	189/191 (99%)	172 (91%)	17 (9%)	9	18
1	B	190/191 (100%)	174 (92%)	16 (8%)	10	20
1	C	190/191 (100%)	179 (94%)	11 (6%)	18	36
1	D	188/191 (98%)	175 (93%)	13 (7%)	14	28
All	All	757/764 (99%)	700 (92%)	57 (8%)	12	24

All (57) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	37	THR
1	A	39	MET
1	A	42	SER
1	A	63	LYS
1	A	70	GLN
1	A	82	ASN
1	A	89	THR
1	A	101	ARG
1	A	182	VAL
1	A	196	MET
1	A	199	TYR
1	A	202	LEU
1	A	207	SER
1	A	208	ARG
1	A	215	MET
1	A	218	ARG
1	A	248	THR
1	B	25	LYS
1	B	37	THR
1	B	39	MET
1	B	87	ILE
1	B	118	LEU
1	B	128	ARG
1	B	198	LYS
1	B	199	TYR
1	B	208	ARG
1	B	212	GLN
1	B	215	MET
1	B	217	MET
1	B	218	ARG

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Mol	Chain	Res	Type
1	B	220	PRO
1	B	221	ILE
1	B	248	THR
1	C	7	ASN
1	C	53	GLN
1	C	101	ARG
1	C	128	ARG
1	C	189	THR
1	C	191	MET
1	C	198	LYS
1	C	199	TYR
1	C	202	LEU
1	C	215	MET
1	C	218	ARG
1	D	28	LYS
1	D	37	THR
1	D	63	LYS
1	D	71	GLU
1	D	116	VAL
1	D	128	ARG
1	D	198	LYS
1	D	199	TYR
1	D	202	LEU
1	D	217	MET
1	D	218	ARG
1	D	240	ASP
1	D	248	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	81	HIS
1	A	136	ASN
1	B	6	ASN
1	B	31	ASN
1	C	7	ASN
1	C	53	GLN
1	C	212	GLN
1	D	7	ASN
1	D	50	HIS
1	D	54	HIS
1	D	212	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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	258/259 (99%)	0.45	17 (6%) 24 22	32, 52, 103, 133	0
1	B	258/259 (99%)	0.25	6 (2%) 61 57	33, 48, 79, 117	0
1	C	258/259 (99%)	0.51	15 (5%) 29 26	32, 54, 105, 145	0
1	D	256/259 (98%)	0.53	10 (3%) 43 39	35, 59, 88, 111	0
All	All	1030/1036 (99%)	0.44	48 (4%) 36 33	32, 53, 95, 145	0

All (48) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	199	TYR	5.8
1	B	199	TYR	5.8
1	C	199	TYR	4.7
1	D	199	TYR	4.4
1	C	200	VAL	3.9
1	A	206	PRO	3.4
1	C	206	PRO	3.4
1	C	195	ILE	3.3
1	C	210	VAL	3.2
1	A	51	TYR	3.2
1	A	210	VAL	3.1
1	A	195	ILE	2.9
1	D	191	MET	2.9
1	C	45	VAL	2.9
1	C	51	TYR	2.9
1	A	200	VAL	2.7
1	A	43	ALA	2.7
1	A	221	ILE	2.7
1	B	215	MET	2.7
1	A	44	ASP	2.6
1	B	202	LEU	2.6

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Mol	Chain	Res	Type	RSRZ
1	C	203	GLY	2.6
1	C	215	MET	2.6
1	C	205	ALA	2.6
1	C	209	GLU	2.5
1	D	194	SER	2.5
1	D	206	PRO	2.5
1	C	99	PHE	2.5
1	D	130	GLY	2.3
1	D	21	ARG	2.3
1	C	44	ASP	2.3
1	D	195	ILE	2.2
1	C	190	PRO	2.2
1	A	33	ILE	2.2
1	D	132	ALA	2.2
1	D	33	ILE	2.2
1	A	191	MET	2.2
1	C	196	MET	2.2
1	B	206	PRO	2.1
1	A	47	GLY	2.1
1	D	186	GLY	2.1
1	B	191	MET	2.1
1	A	259	VAL	2.1
1	A	4	ALA	2.1
1	A	196	MET	2.1
1	A	142	GLY	2.1
1	A	2	THR	2.0
1	B	60	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 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.