



# Full wwPDB X-ray Structure Validation Report ⓘ

Apr 14, 2025 – 06:27 PM EDT

PDB ID : 1VJU / pdb\_00001vju  
Title : Coproporphyrinogen III oxidase from Leishmania major  
Authors : Structural Genomics of Pathogenic Protozoa Consortium (SGPP)  
Deposited on : 2004-03-29  
Resolution : 1.40 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](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	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0rc1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.006 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.42

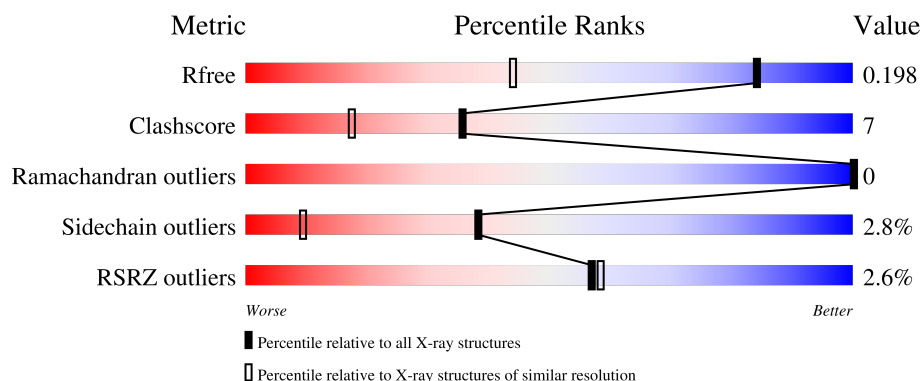
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.40 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))
$R_{free}$	164625	2247 (1.40-1.40)
Clashscore	180529	2446 (1.40-1.40)
Ramachandran outliers	177936	2398 (1.40-1.40)
Sidechain outliers	177891	2397 (1.40-1.40)
RSRZ outliers	164620	2246 (1.40-1.40)

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  $\geq 3$ , 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	309	 2% 77% 15% • 6%
1	B	309	 3% 81% 13% • 5%

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 5338 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 Coproporphyrinogen III oxidase.

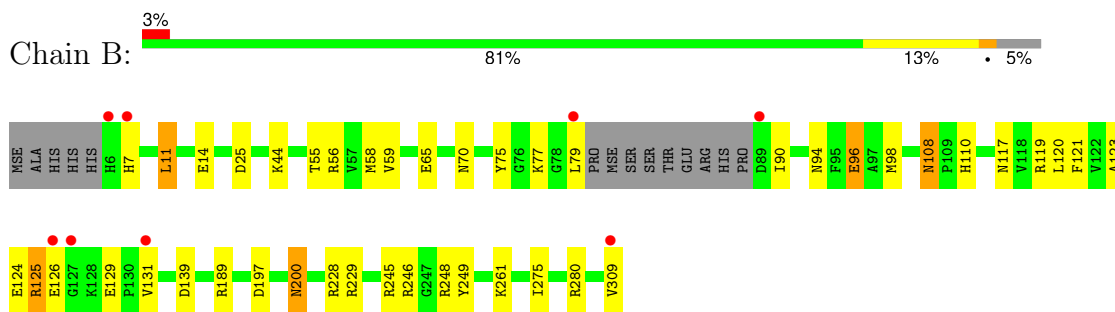
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	291	Total	C	N	O	S	Se	0	0	0
			2327	1493	399	425	6	4			
1	B	295	Total	C	N	O	S	Se	0	2	0
			2367	1517	412	428	6	4			

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	323	Total	O	0	0
			323	323		
2	B	321	Total	O	0	0
			321	321		



- Molecule 1: Coproporphyrinogen III oxidase



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	52.65Å 53.73Å 66.63Å 86.46° 77.13° 61.50°	Depositor
Resolution (Å)	40.00 – 1.40 40.00 – 1.40	Depositor EDS
% Data completeness (in resolution range)	(Not available) (40.00-1.40) 94.9 (40.00-1.40)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.49 (at 1.40Å)	Xtriage
Refinement program	REFMAC refmac_5.2.0000 24/04/2001	Depositor
R, $R_{free}$	0.151 , 0.180 0.171 , 0.198	Depositor DCC
$R_{free}$ test set	5858 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	13.7	Xtriage
Anisotropy	0.161	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.41 , 44.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	5338	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	18.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.66% 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

### 5.1 Standard geometry

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	0.84	1/2390 (0.0%)	1.45	31/3229 (1.0%)
1	B	0.82	1/2441 (0.0%)	1.41	26/3297 (0.8%)
All	All	0.83	2/4831 (0.0%)	1.43	57/6526 (0.9%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	98	MSE	SE-CE	-12.08	1.24	1.95
1	B	58	MSE	SE-CE	-8.43	1.45	1.95

All (57) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	125	ARG	NE-CZ-NH1	14.09	127.35	120.30
1	A	228	ARG	NE-CZ-NH1	13.49	127.04	120.30
1	B	125	ARG	NE-CZ-NH2	-13.03	113.79	120.30
1	A	54	ARG	NE-CZ-NH2	-12.91	113.85	120.30
1	B	248	ARG	NE-CZ-NH2	11.19	125.90	120.30
1	A	98	MSE	CG-SE-CE	-10.90	74.92	98.90
1	A	65	GLU	CG-CD-OE1	9.01	136.33	118.30
1	A	187	GLU	CA-CB-CG	8.71	132.56	113.40
1	B	119	ARG	NE-CZ-NH2	-8.41	116.10	120.30
1	A	228	ARG	NE-CZ-NH2	-8.25	116.17	120.30
1	A	245	ARG	NE-CZ-NH2	-8.24	116.18	120.30
1	A	65	GLU	CG-CD-OE2	-8.21	101.89	118.30
1	B	121	PHE	CB-CG-CD2	-8.14	115.11	120.80
1	A	246	ARG	NE-CZ-NH2	-8.05	116.28	120.30
1	B	246	ARG	NE-CZ-NH2	-7.97	116.32	120.30
1	A	54	ARG	NE-CZ-NH1	7.96	124.28	120.30
1	A	54	ARG	CD-NE-CZ	7.60	134.24	123.60
1	B	245	ARG	NE-CZ-NH2	-6.95	116.83	120.30
1	B	119	ARG	CD-NE-CZ	6.94	133.31	123.60
1	A	241	PHE	CB-CG-CD2	6.92	125.64	120.80

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	14	GLU	OE1-CD-OE2	6.83	131.50	123.30
1	A	43	ASP	CB-CG-OD2	6.81	124.43	118.30
1	A	248	ARG	NE-CZ-NH1	6.80	123.70	120.30
1	B	228	ARG	NE-CZ-NH2	6.65	123.62	120.30
1	B	11	LEU	CB-CG-CD2	-6.57	99.83	111.00
1	B	25	ASP	CB-CG-OD1	6.27	123.94	118.30
1	A	209	GLU	CG-CD-OE1	6.25	130.80	118.30
1	B	229	ARG	NE-CZ-NH1	-6.22	117.19	120.30
1	A	249	TYR	CB-CG-CD2	6.19	124.72	121.00
1	B	189	ARG	NE-CZ-NH2	6.11	123.36	120.30
1	A	208	PHE	CB-CG-CD1	5.96	124.97	120.80
1	A	153	PHE	CB-CG-CD2	5.85	124.90	120.80
1	A	56	ARG	NE-CZ-NH1	-5.84	117.38	120.30
1	A	121	PHE	CB-CG-CD2	-5.83	116.72	120.80
1	A	187	GLU	CG-CD-OE2	-5.80	106.70	118.30
1	B	96	GLU	CG-CD-OE1	5.70	129.71	118.30
1	A	167	ASP	CB-CG-OD1	5.69	123.42	118.30
1	B	249	TYR	CB-CG-CD2	5.65	124.39	121.00
1	A	295	GLU	OE1-CD-OE2	-5.59	116.59	123.30
1	A	14	GLU	OE1-CD-OE2	-5.52	116.67	123.30
1	A	126	GLU	CB-CA-C	5.51	121.41	110.40
1	B	228	ARG	NE-CZ-NH1	-5.41	117.59	120.30
1	A	248	ARG	NH1-CZ-NH2	-5.40	113.46	119.40
1	A	144	TYR	CB-CG-CD2	5.37	124.22	121.00
1	B	56	ARG	NE-CZ-NH2	-5.34	117.63	120.30
1	B	139	ASP	CB-CG-OD1	5.34	123.11	118.30
1	B	56	ARG	NE-CZ-NH1	5.30	122.95	120.30
1	B	275	ILE	CG1-CB-CG2	5.27	123.00	111.40
1	B	309	VAL	CG1-CB-CG2	-5.22	102.54	110.90
1	B	65	GLU	CG-CD-OE2	-5.22	107.87	118.30
1	B	248	ARG	NH1-CZ-NH2	-5.20	113.68	119.40
1	B	44	LYS	CA-CB-CG	5.13	124.68	113.40
1	A	18	ASP	CB-CG-OD1	5.11	122.90	118.30
1	B	197	ASP	CB-CG-OD1	5.08	122.88	118.30
1	A	44	LYS	CA-CB-CG	5.08	124.58	113.40
1	A	248	ARG	NE-CZ-NH2	5.06	122.83	120.30
1	A	14	GLU	CG-CD-OE1	5.01	128.32	118.30

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	2327	0	2194	38	1
1	B	2367	0	2232	28	1
2	A	323	0	0	11	0
2	B	321	0	0	8	0
All	All	5338	0	4426	66	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 7.

All (66) 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:98:MSE:CE	1:A:98:MSE:SE	1.24	1.43
1:A:98:MSE:CE	1:A:98:MSE:CG	2.00	1.37
1:B:98:MSE:CE	1:B:120:LEU:HD23	1.69	1.22
1:B:261:LYS:HG3	2:B:506:HOH:O	1.44	1.14
1:A:98:MSE:SE	1:A:98:MSE:HE3	1.81	1.08
1:A:98:MSE:SE	1:A:98:MSE:HE1	1.81	1.06
1:A:98:MSE:SE	1:A:98:MSE:HE2	1.81	1.04
1:A:261:LYS:HG3	2:A:496:HOH:O	1.57	1.02
1:B:123:ALA:HB3	1:B:131:VAL:CG1	1.90	1.00
1:B:98:MSE:HE2	1:B:120:LEU:HD23	1.43	0.97
1:A:98:MSE:CE	1:A:98:MSE:HG2	1.95	0.92
1:A:54:ARG:HD3	2:A:584:HOH:O	1.75	0.85
1:A:98:MSE:CG	1:A:98:MSE:HE3	1.93	0.84
1:B:98:MSE:HE3	1:B:120:LEU:HD23	1.60	0.81
1:A:98:MSE:HE3	1:A:98:MSE:HG2	1.59	0.81
1:A:98:MSE:CG	1:A:98:MSE:HE2	1.93	0.78
1:A:55:THR:HG23	1:A:70:ASN:OD1	1.82	0.78
1:A:42:GLU:OE2	1:A:44:LYS:HG2	1.86	0.76
1:A:13:VAL:HG13	1:A:98:MSE:HE1	1.67	0.75
1:B:98:MSE:CE	1:B:120:LEU:CD2	2.60	0.72
1:B:123:ALA:HB3	1:B:131:VAL:HG12	1.73	0.70
1:A:155:GLN:HE22	1:A:158:GLN:HE21	1.40	0.68
1:A:44:LYS:HG3	2:A:539:HOH:O	1.94	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:108:ASN:HD22	1:B:110:HIS:H	1.46	0.64
1:A:282:ARG:NH1	2:A:602:HOH:O	2.30	0.63
1:B:98:MSE:HE3	1:B:120:LEU:CD2	2.30	0.61
1:B:108:ASN:ND2	1:B:110:HIS:H	1.99	0.60
1:B:110:HIS:HD2	2:B:364:HOH:O	1.86	0.59
1:A:108:ASN:ND2	1:A:110:HIS:H	2.01	0.58
1:A:148:GLU:HG3	2:A:588:HOH:O	2.03	0.58
1:A:305:LYS:NZ	1:A:307:GLN:O	2.30	0.56
1:A:108:ASN:HD22	1:A:110:HIS:H	1.53	0.56
1:B:123:ALA:HB3	1:B:131:VAL:HG11	1.86	0.55
1:B:117[B]:ASN:ND2	2:B:520:HOH:O	2.21	0.55
1:A:117:ASN:ND2	1:A:119:ARG:HH11	2.04	0.54
1:B:261:LYS:CD	2:B:506:HOH:O	2.55	0.54
1:B:7:HIS:HD2	2:B:621:HOH:O	1.91	0.54
1:A:91:ALA:HB1	2:A:609:HOH:O	2.08	0.53
1:B:200:ASN:HD22	1:B:200:ASN:C	2.12	0.53
1:A:90:ILE:N	2:A:571:HOH:O	2.41	0.53
1:B:94:ASN:HB2	1:B:124:GLU:HG2	1.90	0.53
1:B:90:ILE:HG21	1:B:131:VAL:HG11	1.90	0.52
1:A:155:GLN:HE22	1:A:158:GLN:NE2	2.07	0.51
1:B:125:ARG:HD3	1:B:129:GLU:O	2.10	0.51
1:B:280:ARG:NH2	2:B:596:HOH:O	2.45	0.49
1:A:44:LYS:HE3	2:A:539:HOH:O	2.11	0.49
1:A:105:HIS:HE1	1:A:276:SER:O	1.95	0.49
1:A:252:PHE:HD1	1:A:253:ASN:HD22	1.62	0.48
1:A:225:ILE:HG12	1:A:228:ARG:HH21	1.78	0.48
1:A:108:ASN:HD22	1:A:108:ASN:C	2.17	0.48
1:A:155:GLN:NE2	1:A:158:GLN:HE21	2.09	0.48
1:B:123:ALA:HB3	1:B:131:VAL:HG13	1.88	0.47
1:A:280:ARG:HD3	2:A:479:HOH:O	2.13	0.47
1:B:108:ASN:HD22	1:B:108:ASN:C	2.17	0.47
1:A:237:GLN:NE2	1:A:237:GLN:H	2.14	0.46
1:B:75:TYR:HB3	1:B:96:GLU:HG2	1.98	0.46
1:B:79:LEU:C	2:B:592:HOH:O	2.54	0.45
1:A:261:LYS:CD	2:A:496:HOH:O	2.62	0.45
1:A:44:LYS:NZ	2:A:585:HOH:O	2.49	0.45
1:B:55:THR:HG23	1:B:70:ASN:OD1	2.17	0.45
1:A:123:ALA:HB3	1:A:131:VAL:HG13	2.00	0.43
1:A:123:ALA:HB3	1:A:131:VAL:CG1	2.48	0.43
1:B:79:LEU:HD13	1:B:79:LEU:HA	1.91	0.42
1:B:59:VAL:HG23	2:B:507:HOH:O	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:131:VAL:HG13	1:B:131:VAL:O	2.18	0.42
1:A:70:ASN:O	1:A:100:VAL:HA	2.21	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:280:ARG:NE	1:B:280:ARG:NE[1_655]	2.06	0.14

## 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	287/309 (93%)	281 (98%)	6 (2%)	0	100	100
1	B	293/309 (95%)	286 (98%)	7 (2%)	0	100	100
All	All	580/618 (94%)	567 (98%)	13 (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	234/251 (93%)	226 (97%)	8 (3%)	32	6

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	B	238/251 (95%)	233 (98%)	5 (2%)	48 18
All	All	472/502 (94%)	459 (97%)	13 (3%)	38 9

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	10	SER
1	A	108	ASN
1	A	117	ASN
1	A	126	GLU
1	A	128	LYS
1	A	187	GLU
1	A	236	GLU
1	A	286	ASN
1	B	11	LEU
1	B	77	LYS
1	B	108	ASN
1	B	126	GLU
1	B	200	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	105	HIS
1	A	108	ASN
1	A	117	ASN
1	A	158	GLN
1	A	237	GLN
1	A	253	ASN
1	A	286	ASN
1	A	307	GLN
1	B	7	HIS
1	B	108	ASN
1	B	110	HIS
1	B	155	GLN
1	B	200	ASN
1	B	286	ASN
1	B	307	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, 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	287/309 (92%)	-0.07	7 (2%) 59 61	9, 15, 31, 43	0
1	B	291/309 (94%)	-0.10	8 (2%) 56 57	10, 15, 30, 49	2 (0%)
All	All	578/618 (93%)	-0.09	15 (2%) 57 58	9, 15, 31, 49	2 (0%)

All (15) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	79	LEU	4.2
1	A	127	GLY	3.8
1	A	90	ILE	3.6
1	B	6	HIS	3.0
1	B	131	VAL	2.8
1	A	50	GLY	2.7
1	A	258	ARG	2.6
1	A	78	GLY	2.6
1	A	126	GLU	2.5
1	B	126	GLU	2.5
1	B	89	ASP	2.4
1	B	127	GLY	2.4
1	A	129	GLU	2.4
1	B	7	HIS	2.3
1	B	309	VAL	2.3

### 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.