



# Full wwPDB X-ray Structure Validation Report ⓘ

Nov 21, 2023 – 08:21 AM JST

PDB ID : 7FFG  
Title : Diarylpentanoid-producing polyketide synthase (N199F mutant)  
Authors : Morita, H.; Wong, C.P.; Liu, Q.; Kodama, T.; Lee, Y.; Nakashima, Y.  
Deposited on : 2021-07-23  
Resolution : 2.30 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  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

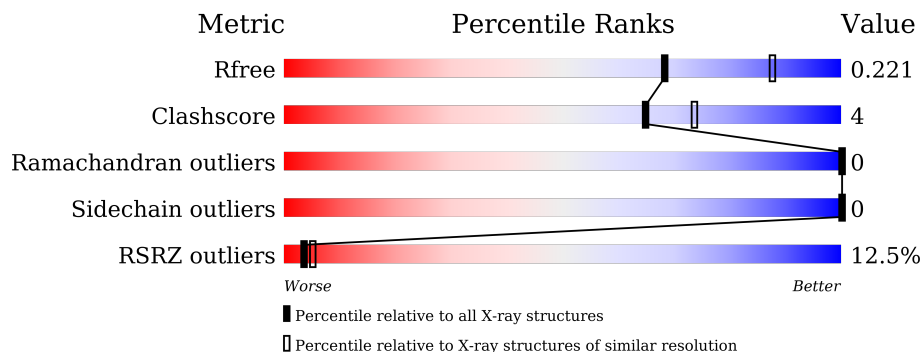
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*



The reported resolution of this entry is 2.30 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))
$R_{free}$	130704	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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	431	 8% 81% 8% 11%
1	B	431	 14% 78% 11% 11%

## 2 Entry composition i

There are 2 unique types of molecules in this entry. The entry contains 6023 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 Type III polyketide synthase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	385	2949	1884	503	549	13	0	0	0
1	B	385	2945	1881	502	549	13	0	0	0

There are 70 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-33	MET	-	initiating methionine	UNP A0A385MEG6
A	-32	GLY	-	expression tag	UNP A0A385MEG6
A	-31	SER	-	expression tag	UNP A0A385MEG6
A	-30	SER	-	expression tag	UNP A0A385MEG6
A	-29	HIS	-	expression tag	UNP A0A385MEG6
A	-28	HIS	-	expression tag	UNP A0A385MEG6
A	-27	HIS	-	expression tag	UNP A0A385MEG6
A	-26	HIS	-	expression tag	UNP A0A385MEG6
A	-25	HIS	-	expression tag	UNP A0A385MEG6
A	-24	HIS	-	expression tag	UNP A0A385MEG6
A	-23	SER	-	expression tag	UNP A0A385MEG6
A	-22	SER	-	expression tag	UNP A0A385MEG6
A	-21	GLY	-	expression tag	UNP A0A385MEG6
A	-20	LEU	-	expression tag	UNP A0A385MEG6
A	-19	VAL	-	expression tag	UNP A0A385MEG6
A	-18	PRO	-	expression tag	UNP A0A385MEG6
A	-17	ARG	-	expression tag	UNP A0A385MEG6
A	-16	GLY	-	expression tag	UNP A0A385MEG6
A	-15	SER	-	expression tag	UNP A0A385MEG6
A	-14	HIS	-	expression tag	UNP A0A385MEG6
A	-13	MET	-	expression tag	UNP A0A385MEG6
A	-12	ALA	-	expression tag	UNP A0A385MEG6
A	-11	SER	-	expression tag	UNP A0A385MEG6
A	-10	MET	-	expression tag	UNP A0A385MEG6
A	-9	THR	-	expression tag	UNP A0A385MEG6

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-8	GLY	-	expression tag	UNP A0A385MEG6
A	-7	GLY	-	expression tag	UNP A0A385MEG6
A	-6	GLN	-	expression tag	UNP A0A385MEG6
A	-5	GLN	-	expression tag	UNP A0A385MEG6
A	-4	MET	-	expression tag	UNP A0A385MEG6
A	-3	GLY	-	expression tag	UNP A0A385MEG6
A	-2	ARG	-	expression tag	UNP A0A385MEG6
A	-1	GLY	-	expression tag	UNP A0A385MEG6
A	0	SER	-	expression tag	UNP A0A385MEG6
A	199	PHE	ASN	engineered mutation	UNP A0A385MEG6
B	-33	MET	-	initiating methionine	UNP A0A385MEG6
B	-32	GLY	-	expression tag	UNP A0A385MEG6
B	-31	SER	-	expression tag	UNP A0A385MEG6
B	-30	SER	-	expression tag	UNP A0A385MEG6
B	-29	HIS	-	expression tag	UNP A0A385MEG6
B	-28	HIS	-	expression tag	UNP A0A385MEG6
B	-27	HIS	-	expression tag	UNP A0A385MEG6
B	-26	HIS	-	expression tag	UNP A0A385MEG6
B	-25	HIS	-	expression tag	UNP A0A385MEG6
B	-24	HIS	-	expression tag	UNP A0A385MEG6
B	-23	SER	-	expression tag	UNP A0A385MEG6
B	-22	SER	-	expression tag	UNP A0A385MEG6
B	-21	GLY	-	expression tag	UNP A0A385MEG6
B	-20	LEU	-	expression tag	UNP A0A385MEG6
B	-19	VAL	-	expression tag	UNP A0A385MEG6
B	-18	PRO	-	expression tag	UNP A0A385MEG6
B	-17	ARG	-	expression tag	UNP A0A385MEG6
B	-16	GLY	-	expression tag	UNP A0A385MEG6
B	-15	SER	-	expression tag	UNP A0A385MEG6
B	-14	HIS	-	expression tag	UNP A0A385MEG6
B	-13	MET	-	expression tag	UNP A0A385MEG6
B	-12	ALA	-	expression tag	UNP A0A385MEG6
B	-11	SER	-	expression tag	UNP A0A385MEG6
B	-10	MET	-	expression tag	UNP A0A385MEG6
B	-9	THR	-	expression tag	UNP A0A385MEG6
B	-8	GLY	-	expression tag	UNP A0A385MEG6
B	-7	GLY	-	expression tag	UNP A0A385MEG6
B	-6	GLN	-	expression tag	UNP A0A385MEG6
B	-5	GLN	-	expression tag	UNP A0A385MEG6
B	-4	MET	-	expression tag	UNP A0A385MEG6
B	-3	GLY	-	expression tag	UNP A0A385MEG6
B	-2	ARG	-	expression tag	UNP A0A385MEG6

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-1	GLY	-	expression tag	UNP A0A385MEG6
B	0	SER	-	expression tag	UNP A0A385MEG6
B	199	PHE	ASN	engineered mutation	UNP A0A385MEG6

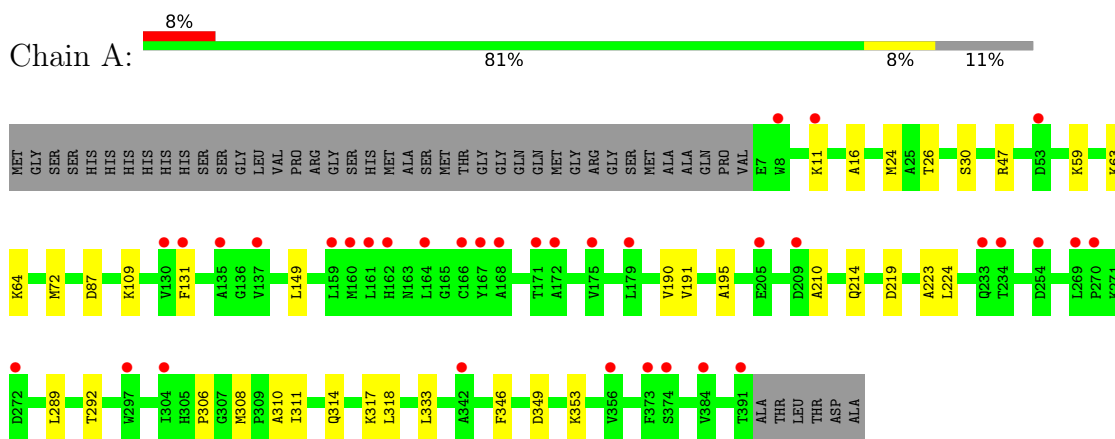
- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	82	Total O 82 82	0	0
2	B	47	Total O 47 47	0	0

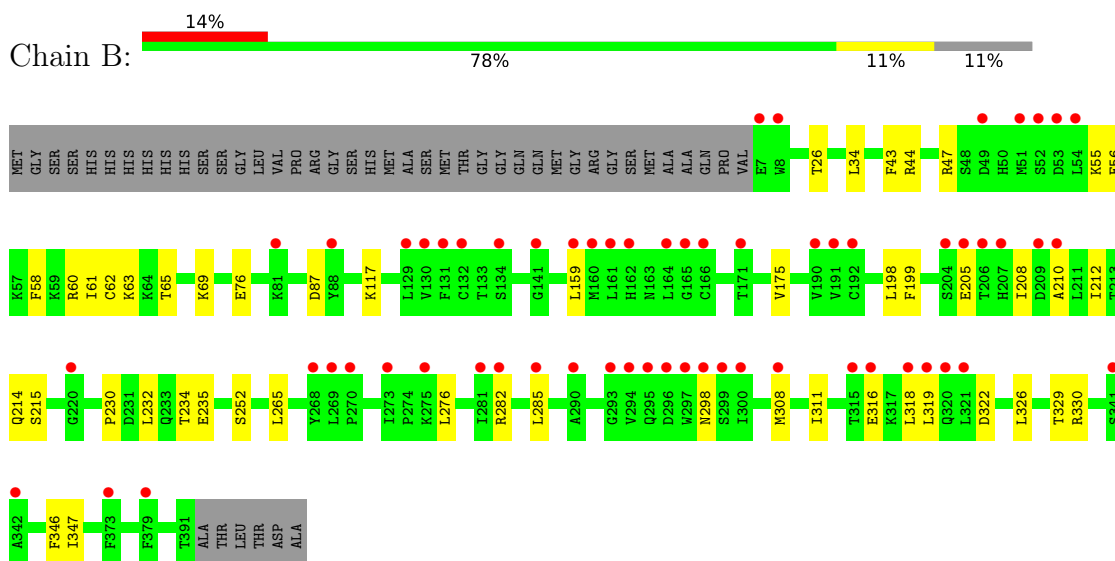
### 3 Residue-property plots [i](#)

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: Type III polyketide synthase



- Molecule 1: Type III polyketide synthase



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	146.62Å 65.14Å 108.02Å 90.00° 128.11° 90.00°	Depositor
Resolution (Å)	41.70 – 2.30 41.70 – 2.30	Depositor EDS
% Data completeness (in resolution range)	99.8 (41.70-2.30) 99.8 (41.70-2.30)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.13 (at 2.29Å)	Xtrriage
Refinement program	PHENIX 1.18.2_3874	Depositor
R, $R_{free}$	0.187 , 0.221 0.187 , 0.221	Depositor DCC
$R_{free}$ test set	1720 reflections (4.81%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	42.3	Xtrriage
Anisotropy	0.236	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 41.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	6023	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 6.38% 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	0.27	0/3011	0.49	0/4090
1	B	0.30	0/3007	0.51	0/4086
All	All	0.28	0/6018	0.50	0/8176

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	2949	0	2977	20	0
1	B	2945	0	2966	29	0
2	A	82	0	0	0	0
2	B	47	0	0	0	0
All	All	6023	0	5943	48	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 (48) 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:234:THR:HG23	1:B:235:GLU:HG3	1.86	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:310:ALA:O	1:A:314:GLN:HG3	2.04	0.57
1:A:314:GLN:HA	1:A:317:LYS:HE3	1.87	0.57
1:A:306:PRO:HB2	1:A:333:LEU:HD22	1.87	0.57
1:A:47:ARG:NH2	1:A:87:ASP:OD2	2.39	0.55
1:B:47:ARG:NH2	1:B:87:ASP:OD1	2.43	0.51
1:B:282:ARG:HH12	1:B:318:LEU:HD11	1.74	0.51
1:B:230:PRO:O	1:B:232:LEU:HD22	2.10	0.51
1:B:282:ARG:NH1	1:B:318:LEU:HD11	2.26	0.50
1:A:308:MET:HB2	1:A:311:ILE:HD12	1.93	0.50
1:B:298:ASN:OD1	1:B:322:ASP:N	2.36	0.49
1:A:26:THR:HB	1:A:346:PHE:CZ	2.47	0.48
1:B:326:LEU:O	1:B:330:ARG:HG3	2.13	0.48
1:B:329:THR:HA	1:B:347:ILE:HG12	1.95	0.48
1:A:195:ALA:HA	1:A:219:ASP:OD1	2.13	0.48
1:A:210:ALA:O	1:A:214:GLN:HG2	2.13	0.48
1:A:109:LYS:HD2	1:A:149:LEU:HB3	1.97	0.47
1:B:205:GLU:H	1:B:205:GLU:CD	2.17	0.47
1:B:159:LEU:HD12	1:B:159:LEU:HA	1.71	0.47
1:B:308:MET:HB2	1:B:311:ILE:HD12	1.97	0.47
1:B:208:ILE:O	1:B:212:ILE:HD12	2.14	0.46
1:B:56:GLU:O	1:B:60:ARG:HG3	2.16	0.46
1:B:199:PHE:CE1	1:B:265:LEU:HD23	2.51	0.45
1:A:11:LYS:NZ	1:A:16:ALA:HA	2.31	0.45
1:B:252:SER:HB2	1:B:276:LEU:HD21	1.99	0.45
1:A:64:LYS:HA	1:A:64:LYS:HE2	1.98	0.45
1:B:198:LEU:HB3	1:B:265:LEU:HB2	1.99	0.45
1:B:285:LEU:HD22	1:B:319:LEU:HD21	2.00	0.44
1:B:62:CYS:O	1:B:65:THR:OG1	2.29	0.44
1:B:44:ARG:NH2	1:B:76:GLU:OE2	2.51	0.44
1:B:210:ALA:O	1:B:214:GLN:HG2	2.17	0.44
1:A:349:ASP:OD2	1:A:353:LYS:HE2	2.18	0.43
1:B:26:THR:HB	1:B:346:PHE:CZ	2.53	0.43
1:B:159:LEU:HD23	1:B:175:VAL:HG11	2.01	0.43
1:B:61:ILE:O	1:B:65:THR:HG23	2.19	0.43
1:B:58:PHE:HE2	1:B:215:SER:HB3	1.84	0.43
1:A:314:GLN:O	1:A:318:LEU:HB2	2.19	0.42
1:A:190:VAL:O	1:A:223:ALA:HA	2.19	0.42
1:A:30:SER:OG	1:B:117:LYS:HE2	2.20	0.42
1:B:34:LEU:HD23	1:B:69:LYS:HB3	2.01	0.42
1:B:63:LYS:HE3	1:B:63:LYS:HB2	1.70	0.42
1:A:59:LYS:O	1:A:63:LYS:HG3	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:43:PHE:CE2	1:B:55:LYS:HA	2.55	0.41
1:A:131:PHE:HA	1:A:191:VAL:O	2.21	0.41
1:B:316:GLU:OE1	1:B:330:ARG:NH2	2.53	0.41
1:A:24:MET:HG2	1:A:224:LEU:HG	2.03	0.41
1:A:289:LEU:O	1:A:292:THR:OG1	2.34	0.40
1:A:72:MET:HA	1:A:219:ASP:OD2	2.22	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	383/431 (89%)	368 (96%)	15 (4%)	0	100	100
1	B	383/431 (89%)	361 (94%)	22 (6%)	0	100	100
All	All	766/862 (89%)	729 (95%)	37 (5%)	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	315/352 (90%)	315 (100%)	0	100	100
1	B	314/352 (89%)	314 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
All	All	629/704 (89%)	629 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 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 monosaccharides 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	385/431 (89%)	0.42	35 (9%) <b>9</b>   <b>12</b>	29, 50, 81, 103	0
1	B	385/431 (89%)	0.70	61 (15%) <b>2</b>   <b>2</b>	35, 59, 99, 131	0
All	All	770/862 (89%)	0.56	96 (12%) <b>3</b>   <b>5</b>	29, 55, 92, 131	0

All (96) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	373	PHE	5.8
1	B	297	TRP	5.8
1	B	269	LEU	4.6
1	B	319	LEU	4.3
1	B	285	LEU	4.1
1	B	204	SER	4.1
1	B	132	CYS	4.1
1	B	207	HIS	4.0
1	B	209	ASP	3.9
1	B	161	LEU	3.9
1	B	206	THR	3.8
1	A	373	PHE	3.7
1	B	53	ASP	3.6
1	B	54	LEU	3.6
1	B	281	ILE	3.6
1	B	268	TYR	3.6
1	B	210	ALA	3.5
1	A	161	LEU	3.4
1	B	293	GLY	3.4
1	A	8	TRP	3.3
1	B	51	MET	3.3
1	B	166	CYS	3.3
1	A	164	LEU	3.3
1	B	270	PRO	3.2

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	A	233	GLN	3.1
1	B	162	HIS	3.1
1	A	175	VAL	3.1
1	B	294	VAL	3.0
1	A	269	LEU	3.0
1	A	131	PHE	3.0
1	B	290	ALA	3.0
1	B	298	ASN	3.0
1	B	131	PHE	3.0
1	B	341	SER	2.9
1	B	160	MET	2.9
1	B	308	MET	2.9
1	A	270	PRO	2.9
1	A	130	VAL	2.8
1	B	130	VAL	2.8
1	B	342	ALA	2.8
1	B	295	GLN	2.8
1	A	166	CYS	2.8
1	A	254	ASP	2.8
1	B	49	ASP	2.8
1	B	192	CYS	2.8
1	B	190	VAL	2.7
1	A	162	HIS	2.7
1	A	159	LEU	2.7
1	A	168	ALA	2.7
1	B	159	LEU	2.7
1	B	171	THR	2.7
1	A	297	TRP	2.6
1	A	356	VAL	2.6
1	B	379	PHE	2.6
1	A	11	LYS	2.6
1	B	164	LEU	2.5
1	A	272	ASP	2.5
1	B	275	LYS	2.5
1	A	171	THR	2.5
1	B	300	ILE	2.5
1	B	52	SER	2.4
1	B	141	GLY	2.4
1	B	296	ASP	2.4
1	A	135	ALA	2.4
1	B	320	GLN	2.4
1	B	7	GLU	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	53	ASP	2.4
1	A	160	MET	2.4
1	A	209	ASP	2.4
1	B	88	TYR	2.3
1	B	8	TRP	2.3
1	B	282	ARG	2.3
1	A	391	THR	2.3
1	A	205	GLU	2.3
1	B	165	GLY	2.2
1	B	191	VAL	2.2
1	B	315	THR	2.2
1	B	134	SER	2.2
1	A	179	LEU	2.2
1	A	172	ALA	2.2
1	A	342	ALA	2.2
1	A	234	THR	2.1
1	B	129	LEU	2.1
1	A	137	VAL	2.1
1	B	318	LEU	2.1
1	B	273	ILE	2.1
1	B	299	SER	2.1
1	B	321	LEU	2.1
1	B	316	GLU	2.1
1	B	81	LYS	2.1
1	A	374	SER	2.1
1	A	304	ILE	2.1
1	B	205	GLU	2.1
1	A	384	VAL	2.1
1	A	167	TYR	2.0
1	B	220	GLY	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

There are no ligands in this entry.

## 6.5 Other polymers

There are no such residues in this entry.