



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 10, 2026 – 01:31 AM UTC

PDB ID : 1KXZ / pdb_00001kxz
Title : MT0146, the Precorrin-6y methyltransferase (CbiT) homolog from *M. Thermotrophicum*, P1 spacegroup
Authors : Keller, J.P.; Smith, P.M.; Benach, J.; Christendat, D.; DeTitta, G.; Hunt, J.F.
Deposited on : 2002-02-01
Resolution : 2.70 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (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

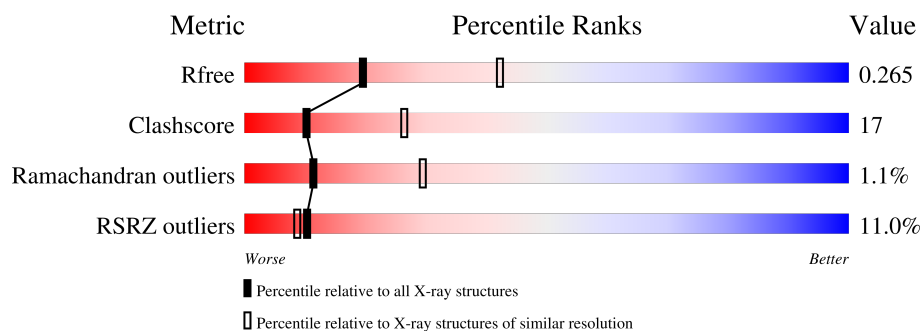
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 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}	180053	3538 (2.70-2.70)
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

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	192	10% 66% 30% ..
1	B	192	8% 63% 32% ..
1	C	192	8% 64% 33% ..
1	D	192	14% 63% 33% ..
1	E	192	4% 61% 34% ..
1	F	192	14% 65% 31% ..
1	G	192	16% 63% 33% ..

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Mol	Chain	Length	Quality of chain
1	H	192	7% 68% 29%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 11247 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 Precorrin-6y methyltransferase/putative decarboxylase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	186	Total	C	N	O	S	Se	0	0	0
			1392	868	244	267	5	8			
1	B	186	Total	C	N	O	S	Se	0	0	0
			1392	868	244	267	5	8			
1	C	186	Total	C	N	O	S	Se	0	0	0
			1392	868	244	267	5	8			
1	D	186	Total	C	N	O	S	Se	0	0	0
			1392	868	244	267	5	8			
1	E	186	Total	C	N	O	S	Se	0	0	0
			1392	868	244	267	5	8			
1	F	186	Total	C	N	O	S	Se	0	0	0
			1392	868	244	267	5	8			
1	G	186	Total	C	N	O	S	Se	0	0	0
			1392	868	244	267	5	8			
1	H	186	Total	C	N	O	S	Se	0	0	0
			1392	868	244	267	5	8			

There are 64 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MSE	MET	modified residue	UNP O26249
A	19	MSE	MET	modified residue	UNP O26249
A	26	MSE	MET	modified residue	UNP O26249
A	73	MSE	MET	modified residue	UNP O26249
A	87	MSE	MET	modified residue	UNP O26249
A	144	MSE	MET	modified residue	UNP O26249
A	172	MSE	MET	modified residue	UNP O26249
A	173	MSE	MET	modified residue	UNP O26249
B	1	MSE	MET	modified residue	UNP O26249
B	19	MSE	MET	modified residue	UNP O26249
B	26	MSE	MET	modified residue	UNP O26249
B	73	MSE	MET	modified residue	UNP O26249
B	87	MSE	MET	modified residue	UNP O26249

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Chain	Residue	Modelled	Actual	Comment	Reference
B	144	MSE	MET	modified residue	UNP O26249
B	172	MSE	MET	modified residue	UNP O26249
B	173	MSE	MET	modified residue	UNP O26249
C	1	MSE	MET	modified residue	UNP O26249
C	19	MSE	MET	modified residue	UNP O26249
C	26	MSE	MET	modified residue	UNP O26249
C	73	MSE	MET	modified residue	UNP O26249
C	87	MSE	MET	modified residue	UNP O26249
C	144	MSE	MET	modified residue	UNP O26249
C	172	MSE	MET	modified residue	UNP O26249
C	173	MSE	MET	modified residue	UNP O26249
D	1	MSE	MET	modified residue	UNP O26249
D	19	MSE	MET	modified residue	UNP O26249
D	26	MSE	MET	modified residue	UNP O26249
D	73	MSE	MET	modified residue	UNP O26249
D	87	MSE	MET	modified residue	UNP O26249
D	144	MSE	MET	modified residue	UNP O26249
D	172	MSE	MET	modified residue	UNP O26249
D	173	MSE	MET	modified residue	UNP O26249
E	1	MSE	MET	modified residue	UNP O26249
E	19	MSE	MET	modified residue	UNP O26249
E	26	MSE	MET	modified residue	UNP O26249
E	73	MSE	MET	modified residue	UNP O26249
E	87	MSE	MET	modified residue	UNP O26249
E	144	MSE	MET	modified residue	UNP O26249
E	172	MSE	MET	modified residue	UNP O26249
E	173	MSE	MET	modified residue	UNP O26249
F	1	MSE	MET	modified residue	UNP O26249
F	19	MSE	MET	modified residue	UNP O26249
F	26	MSE	MET	modified residue	UNP O26249
F	73	MSE	MET	modified residue	UNP O26249
F	87	MSE	MET	modified residue	UNP O26249
F	144	MSE	MET	modified residue	UNP O26249
F	172	MSE	MET	modified residue	UNP O26249
F	173	MSE	MET	modified residue	UNP O26249
G	1	MSE	MET	modified residue	UNP O26249
G	19	MSE	MET	modified residue	UNP O26249
G	26	MSE	MET	modified residue	UNP O26249
G	73	MSE	MET	modified residue	UNP O26249
G	87	MSE	MET	modified residue	UNP O26249
G	144	MSE	MET	modified residue	UNP O26249
G	172	MSE	MET	modified residue	UNP O26249

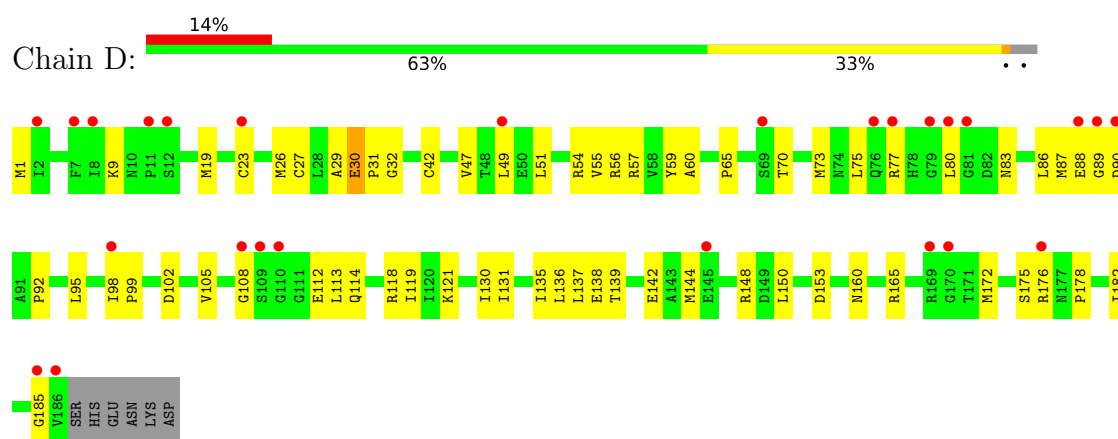
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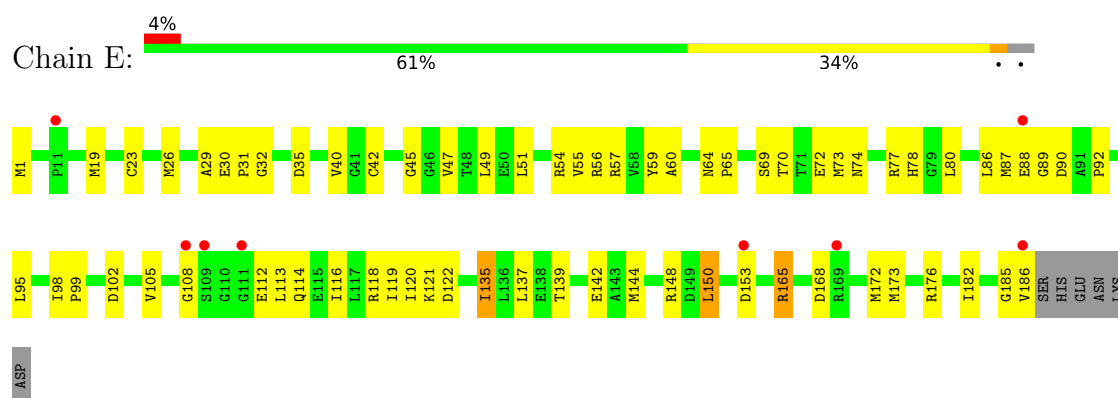
Chain	Residue	Modelled	Actual	Comment	Reference
G	173	MSE	MET	modified residue	UNP O26249
H	1	MSE	MET	modified residue	UNP O26249
H	19	MSE	MET	modified residue	UNP O26249
H	26	MSE	MET	modified residue	UNP O26249
H	73	MSE	MET	modified residue	UNP O26249
H	87	MSE	MET	modified residue	UNP O26249
H	144	MSE	MET	modified residue	UNP O26249
H	172	MSE	MET	modified residue	UNP O26249
H	173	MSE	MET	modified residue	UNP O26249

- Molecule 2 is water.

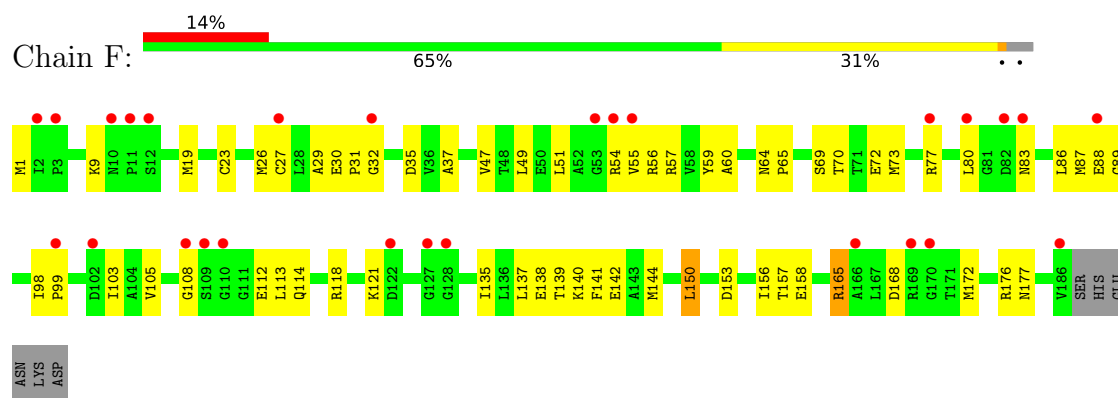
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	20	Total O 20 20	0	0
2	B	12	Total O 12 12	0	0
2	C	12	Total O 12 12	0	0
2	D	15	Total O 15 15	0	0
2	E	9	Total O 9 9	0	0
2	F	10	Total O 10 10	0	0
2	G	16	Total O 16 16	0	0
2	H	17	Total O 17 17	0	0



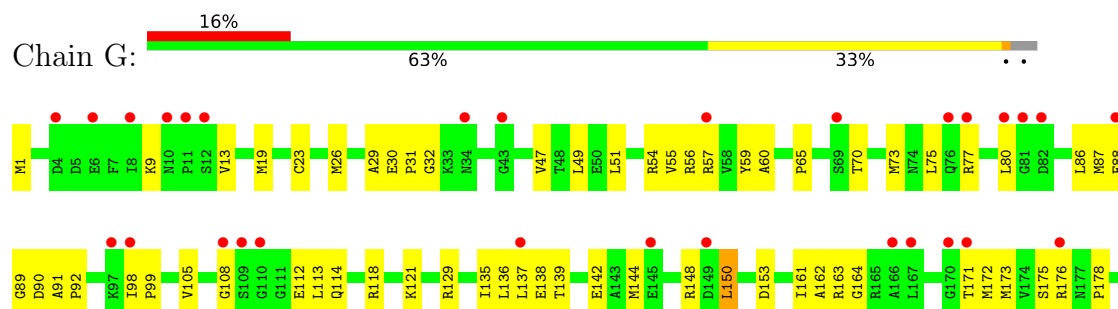
- Molecule 1: Precorrin-6y methyltransferase/putative decarboxylase

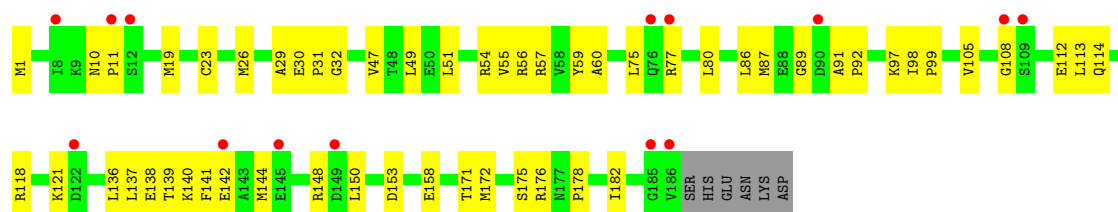


- Molecule 1: Precorrin-6y methyltransferase/putative decarboxylase



- Molecule 1: Precorrin-6y methyltransferase/putative decarboxylase





4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	59.10Å 76.00Å 97.20Å 70.90° 78.80° 66.70°	Depositor
Resolution (Å)	36.65 – 2.70 36.65 – 2.70	Depositor EDS
% Data completeness (in resolution range)	(Not available) (36.65-2.70) 96.7 (36.65-2.70)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.21 (at 2.68Å)	Xtriage
Refinement program	X-PLOR 3.851	Depositor
R, R_{free}	0.212 , 0.257 (Not available) , 0.265	Depositor DCC
R_{free} test set	3939 reflections (10.06%)	wwPDB-VP
Wilson B-factor (Å ²)	45.1	Xtriage
Anisotropy	0.170	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 56.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	11247	wwPDB-VP
Average B, all atoms (Å ²)	42.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.00% 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	0.85	0/1400	1.17	8/1882 (0.4%)
1	B	0.80	0/1400	1.18	11/1882 (0.6%)
1	C	0.90	0/1400	1.17	6/1882 (0.3%)
1	D	0.90	0/1400	1.18	9/1882 (0.5%)
1	E	0.84	1/1400 (0.1%)	1.17	11/1882 (0.6%)
1	F	0.86	0/1400	1.18	8/1882 (0.4%)
1	G	0.92	0/1400	1.18	9/1882 (0.5%)
1	H	0.90	0/1400	1.16	4/1882 (0.2%)
All	All	0.87	1/11200 (0.0%)	1.17	66/15056 (0.4%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	E	120	ILE	CA-CB	-5.26	1.48	1.54

The worst 5 of 66 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	176	ARG	N-CA-C	-8.57	97.14	110.42
1	H	176	ARG	N-CA-C	-8.41	97.38	110.42
1	G	176	ARG	N-CA-C	-8.41	98.07	110.52
1	D	176	ARG	N-CA-C	-7.82	98.30	110.42
1	B	176	ARG	N-CA-C	-7.79	98.34	110.42

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	1392	0	1437	56	0
1	B	1392	0	1437	54	0
1	C	1392	0	1437	62	1
1	D	1392	0	1437	57	1
1	E	1392	0	1437	45	1
1	F	1392	0	1437	63	0
1	G	1392	0	1437	60	1
1	H	1392	0	1437	55	2
2	A	20	0	0	7	0
2	B	12	0	0	5	0
2	C	12	0	0	1	0
2	D	15	0	0	2	0
2	E	9	0	0	3	0
2	F	10	0	0	1	0
2	G	16	0	0	6	0
2	H	17	0	0	1	0
All	All	11247	0	11496	387	3

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 17.

The worst 5 of 387 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:137:LEU:HD21	1:C:144:MSE:HG3	1.49	0.94
1:G:56:ARG:HD3	2:G:195:HOH:O	1.71	0.90
1:G:148:ARG:HD2	2:G:208:HOH:O	1.75	0.85
1:A:138:GLU:HG3	1:C:141:PHE:HE1	1.40	0.85
1:F:141:PHE:HE1	1:H:138:GLU:HG3	1.43	0.84

All (3) 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:C:10:ASN:ND2	1:G:77:ARG:NH1[1_545]	2.08	0.12
1:D:77:ARG:NH1	1:H:10:ASN:ND2[1_545]	2.12	0.08
1:E:122:ASP:O	1:H:118:ARG:NE[1_655]	2.15	0.05

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	184/192 (96%)	177 (96%)	5 (3%)	2 (1%)	11	29
1	B	184/192 (96%)	177 (96%)	5 (3%)	2 (1%)	11	29
1	C	184/192 (96%)	178 (97%)	4 (2%)	2 (1%)	11	29
1	D	184/192 (96%)	177 (96%)	5 (3%)	2 (1%)	11	29
1	E	184/192 (96%)	178 (97%)	4 (2%)	2 (1%)	11	29
1	F	184/192 (96%)	177 (96%)	5 (3%)	2 (1%)	11	29
1	G	184/192 (96%)	177 (96%)	5 (3%)	2 (1%)	11	29
1	H	184/192 (96%)	177 (96%)	5 (3%)	2 (1%)	11	29
All	All	1472/1536 (96%)	1418 (96%)	38 (3%)	16 (1%)	11	29

5 of 16 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	108	GLY
1	A	112	GLU
1	B	108	GLY
1	B	112	GLU
1	C	108	GLY

5.3.2 Protein sidechains [i](#)

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

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	178/192 (92%)	1.00	20 (11%) 10 8	14, 40, 73, 91	0
1	B	178/192 (92%)	0.82	15 (8%) 17 14	12, 42, 75, 92	0
1	C	178/192 (92%)	0.66	15 (8%) 17 14	10, 39, 73, 90	0
1	D	178/192 (92%)	1.05	26 (14%) 6 5	11, 38, 72, 89	0
1	E	178/192 (92%)	0.66	8 (4%) 38 34	12, 41, 74, 91	0
1	F	178/192 (92%)	1.11	27 (15%) 5 4	12, 41, 73, 92	0
1	G	178/192 (92%)	1.18	31 (17%) 4 3	12, 38, 73, 90	0
1	H	178/192 (92%)	0.57	14 (7%) 18 16	11, 39, 72, 89	0
All	All	1424/1536 (92%)	0.88	156 (10%) 10 9	10, 40, 74, 92	0

The worst 5 of 156 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	186	VAL	5.1
1	G	186	VAL	5.1
1	D	77	ARG	4.7
1	G	77	ARG	4.6
1	F	166	ALA	4.5

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates ⓘ

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.