



Full wwPDB X-ray Structure Validation Report ⓘ

Jan 6, 2025 – 01:04 PM JST

PDB ID : 8YTU
Title : Mipa-PETase from *Micromonospora pattaloongensis*
Authors : Hong, H.; Seo, H.; Park, J.; Kim, K.-J.
Deposited on : 2024-03-26
Resolution : 1.34 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
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.21
EDS : 3.0
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.004 (Gargrove)
Density-Fitness : 1.0.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.40

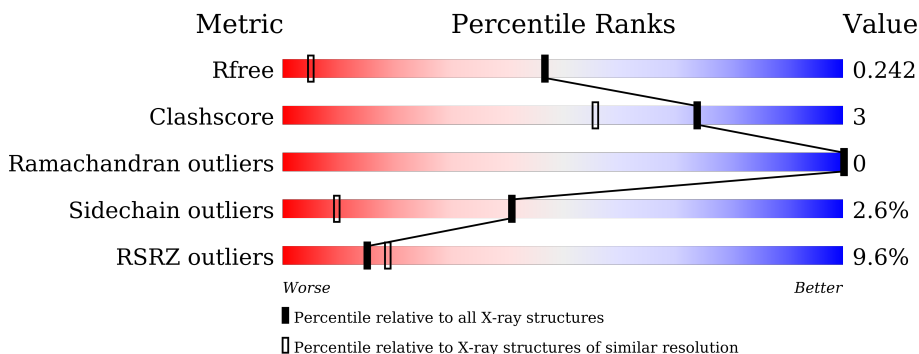
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.34 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	1904 (1.36-1.32)
Clashscore	180529	2038 (1.36-1.32)
Ramachandran outliers	177936	2016 (1.36-1.32)
Sidechain outliers	177891	2016 (1.36-1.32)
RSRZ outliers	164620	1903 (1.36-1.32)

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	265	
1	B	265	
1	C	265	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 6204 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 cutinase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	250	Total 1858	C 1167	N 334	O 351	S 6	0	1	0
1	B	256	Total 1921	C 1205	N 349	O 361	S 6	0	2	0
1	C	257	Total 1932	C 1211	N 351	O 363	S 7	0	3	0

There are 27 discrepancies between the modelled and reference sequences:

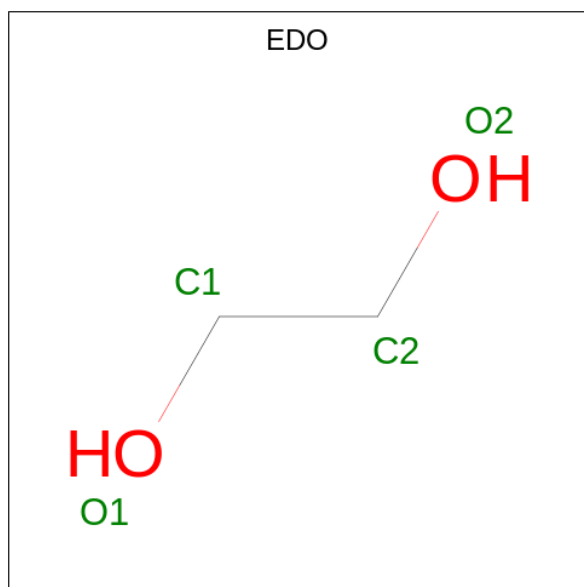
Chain	Residue	Modelled	Actual	Comment	Reference
A	38	MET	-	initiating methionine	UNP A0A1H3QT72
A	295	LEU	-	expression tag	UNP A0A1H3QT72
A	296	GLU	-	expression tag	UNP A0A1H3QT72
A	297	HIS	-	expression tag	UNP A0A1H3QT72
A	298	HIS	-	expression tag	UNP A0A1H3QT72
A	299	HIS	-	expression tag	UNP A0A1H3QT72
A	300	HIS	-	expression tag	UNP A0A1H3QT72
A	301	HIS	-	expression tag	UNP A0A1H3QT72
A	302	HIS	-	expression tag	UNP A0A1H3QT72
B	38	MET	-	initiating methionine	UNP A0A1H3QT72
B	295	LEU	-	expression tag	UNP A0A1H3QT72
B	296	GLU	-	expression tag	UNP A0A1H3QT72
B	297	HIS	-	expression tag	UNP A0A1H3QT72
B	298	HIS	-	expression tag	UNP A0A1H3QT72
B	299	HIS	-	expression tag	UNP A0A1H3QT72
B	300	HIS	-	expression tag	UNP A0A1H3QT72
B	301	HIS	-	expression tag	UNP A0A1H3QT72
B	302	HIS	-	expression tag	UNP A0A1H3QT72
C	38	MET	-	initiating methionine	UNP A0A1H3QT72
C	295	LEU	-	expression tag	UNP A0A1H3QT72
C	296	GLU	-	expression tag	UNP A0A1H3QT72
C	297	HIS	-	expression tag	UNP A0A1H3QT72
C	298	HIS	-	expression tag	UNP A0A1H3QT72

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Chain	Residue	Modelled	Actual	Comment	Reference
C	299	HIS	-	expression tag	UNP A0A1H3QT72
C	300	HIS	-	expression tag	UNP A0A1H3QT72
C	301	HIS	-	expression tag	UNP A0A1H3QT72
C	302	HIS	-	expression tag	UNP A0A1H3QT72

- Molecule 2 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C₂H₆O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			4	2	2		

- Molecule 3 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	B	1	Total C O 6 3 3	0	0

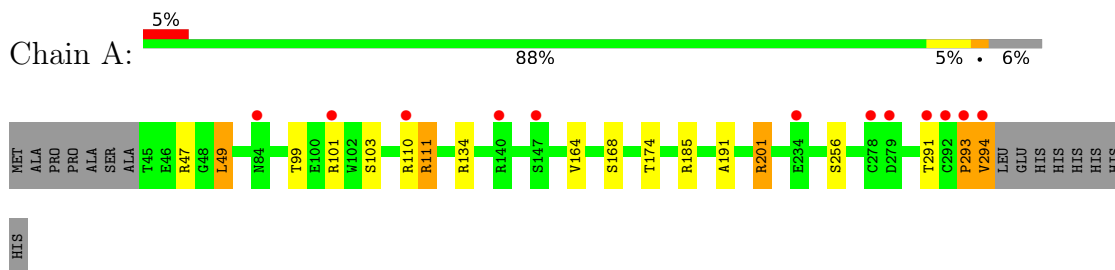
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	199	Total O 199 199	0	0
4	B	176	Total O 176 176	0	0
4	C	108	Total O 108 108	0	0

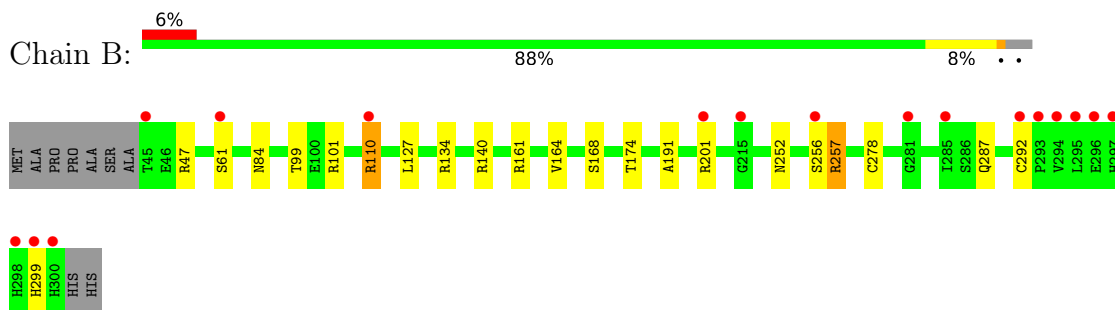
3 Residue-property plots [i](#)

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.

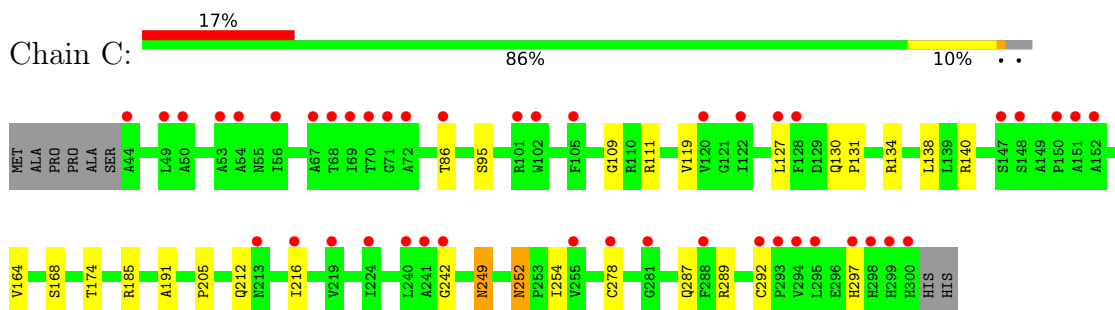
- Molecule 1: cutinase



- Molecule 1: cutinase



- Molecule 1: cutinase



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	49.07Å 103.41Å 131.88Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	36.82 – 1.34 36.82 – 1.34	Depositor EDS
% Data completeness (in resolution range)	96.0 (36.82-1.34) 96.0 (36.82-1.34)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.01 (at 1.34Å)	Xtrriage
Refinement program	REFMAC 5.8.0411	Depositor
R, R_{free}	0.211 , 0.234 0.223 , 0.242	Depositor DCC
R_{free} test set	7745 reflections (5.16%)	wwPDB-VP
Wilson B-factor (Å ²)	15.6	Xtrriage
Anisotropy	0.181	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 35.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	6204	wwPDB-VP
Average B, all atoms (Å ²)	25.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.52% 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](#)

Bond lengths and bond angles in the following residue types are not validated in this section: GOL, EDO

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	0.61	0/1910	0.76	1/2609 (0.0%)
1	B	0.60	0/1977	0.77	0/2700
1	C	0.40	0/1988	0.66	0/2716
All	All	0.55	0/5875	0.73	1/8025 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	6
1	B	0	8
1	C	0	2
All	All	0	16

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	293	PRO	N-CA-C	-5.03	99.03	112.10

There are no chirality outliers.

All (16) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	101	ARG	Sidechain
1	A	110	ARG	Sidechain
1	A	134	ARG	Sidechain

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Mol	Chain	Res	Type	Group
1	A	185	ARG	Sidechain
1	A	201	ARG	Sidechain
1	A	47	ARG	Sidechain
1	B	101	ARG	Sidechain
1	B	110	ARG	Sidechain
1	B	134	ARG	Sidechain
1	B	140	ARG	Sidechain
1	B	161	ARG	Sidechain
1	B	201	ARG	Sidechain
1	B	257	ARG	Sidechain
1	B	47	ARG	Sidechain
1	C	111	ARG	Sidechain
1	C	134	ARG	Sidechain

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	1858	0	1780	9	0
1	B	1921	0	1831	7	0
1	C	1932	0	1842	19	0
2	A	4	0	6	0	0
3	B	6	0	8	0	0
4	A	199	0	0	0	1
4	B	176	0	0	3	0
4	C	108	0	0	1	1
All	All	6204	0	5467	34	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 3.

All (34) 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:293:PRO:HD2	1:A:294:VAL:HG23	1.54	0.88
1:B:278:CYS:SG	4:B:502:HOH:O	2.47	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:111:ARG:HD2	1:A:256:SER:OG	1.98	0.63
1:C:140:ARG:HH11	1:C:140:ARG:HG3	1.64	0.62
1:B:299:HIS:NE2	4:B:502:HOH:O	2.31	0.61
1:A:293:PRO:HD2	1:A:294:VAL:CG2	2.29	0.60
1:C:287:GLN:HE22	1:C:289:ARG:HH21	1.51	0.57
1:C:164:VAL:HG23	1:C:174:THR:HG23	1.89	0.55
1:B:292:CYS:SG	4:B:502:HOH:O	2.47	0.54
1:C:168:SER:HA	1:C:191:ALA:O	2.12	0.50
1:C:140:ARG:HG3	1:C:140:ARG:NH1	2.27	0.49
1:B:278:CYS:HB3	1:B:299:HIS:CE1	2.48	0.49
1:A:291:THR:O	1:A:293:PRO:HD3	2.12	0.49
1:C:212:GLN:HE21	1:C:242:GLY:H	1.59	0.49
1:C:109:GLY:HA2	1:C:119:VAL:HG11	1.95	0.48
1:C:292[B]:CYS:SG	4:C:401:HOH:O	2.55	0.47
1:C:249:ASN:HD22	1:C:249:ASN:N	2.13	0.47
1:C:252:ASN:HD21	1:C:254:ILE:HB	1.80	0.47
1:B:99:THR:HA	1:B:127:LEU:HB3	1.97	0.46
1:C:287:GLN:NE2	1:C:289:ARG:HE	2.14	0.46
1:B:164:VAL:HG23	1:B:174:THR:HG23	1.99	0.45
1:A:49:LEU:HD12	1:A:49:LEU:HA	1.87	0.44
1:A:164:VAL:HG23	1:A:174:THR:HG23	2.00	0.44
1:C:216:ILE:HD12	1:C:216:ILE:N	2.32	0.44
1:C:278:CYS:HG	1:C:297:HIS:HD1	1.64	0.44
1:A:293:PRO:HG2	1:A:294:VAL:HG22	2.00	0.43
1:A:168:SER:HA	1:A:191:ALA:O	2.18	0.43
1:C:252:ASN:C	1:C:252:ASN:HD22	2.22	0.43
1:C:287:GLN:HE21	1:C:289:ARG:HE	1.66	0.42
1:C:130:GLN:HB3	1:C:131:PRO:CD	2.49	0.41
1:B:168:SER:HA	1:B:191:ALA:O	2.20	0.41
1:A:99:THR:HB	1:C:127:LEU:HD11	2.02	0.41
1:C:95:SER:HB2	1:C:138:LEU:HD21	2.03	0.41
1:C:185:ARG:O	1:C:205:PRO:HD2	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)
4:A:623:HOH:O	4:C:450:HOH:O[4_545]	2.16	0.04

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	249/265 (94%)	244 (98%)	5 (2%)	0	100	100
1	B	256/265 (97%)	250 (98%)	6 (2%)	0	100	100
1	C	258/265 (97%)	248 (96%)	10 (4%)	0	100	100
All	All	763/795 (96%)	742 (97%)	21 (3%)	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	191/202 (95%)	186 (97%)	5 (3%)	41	10
1	B	198/202 (98%)	191 (96%)	7 (4%)	31	5
1	C	199/202 (98%)	196 (98%)	3 (2%)	60	28
All	All	588/606 (97%)	573 (97%)	15 (3%)	41	10

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	49	LEU
1	A	103	SER
1	A	111	ARG
1	A	201	ARG
1	A	294	VAL

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Mol	Chain	Res	Type
1	B	61	SER
1	B	84	ASN
1	B	110	ARG
1	B	252	ASN
1	B	256	SER
1	B	257	ARG
1	B	287	GLN
1	C	86	THR
1	C	249	ASN
1	C	252	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	213	ASN
1	B	84	ASN
1	B	252	ASN
1	C	212	GLN
1	C	213	ASN
1	C	246	ASN
1	C	249	ASN
1	C	252	ASN
1	C	287	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](#)

2 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	GOL	B	401	-	5,5,5	0.07	0	5,5,5	0.29	0
2	EDO	A	401	-	3,3,3	0.36	0	2,2,2	0.16	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	GOL	B	401	-	-	0/4/4/4	-
2	EDO	A	401	-	-	0/1/1/1	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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	250/265 (94%)	0.29	12 (4%) 36 46	9, 17, 30, 42	1 (0%)
1	B	256/265 (96%)	0.68	17 (6%) 26 33	9, 21, 39, 79	2 (0%)
1	C	257/265 (96%)	1.10	44 (17%) 5 6	16, 30, 44, 76	3 (1%)
All	All	763/795 (95%)	0.69	73 (9%) 15 19	9, 22, 41, 79	6 (0%)

All (73) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	293	PRO	12.2
1	A	294	VAL	10.2
1	A	292	CYS	8.9
1	C	295	LEU	3.9
1	B	300	HIS	3.6
1	C	293	PRO	3.6
1	C	294	VAL	3.5
1	B	298	HIS	3.4
1	C	299	HIS	3.4
1	C	300	HIS	3.4
1	C	44	ALA	3.4
1	B	281	GLY	3.3
1	A	84	ASN	3.2
1	B	296	GLU	3.1
1	B	292	CYS	3.0
1	B	299	HIS	3.0
1	A	147	SER	3.0
1	C	147	SER	3.0
1	C	216	ILE	3.0
1	C	255	VAL	2.9
1	B	215	GLY	2.9
1	C	292[A]	CYS	2.9
1	C	67	ALA	2.8

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Mol	Chain	Res	Type	RSRZ
1	C	278	CYS	2.8
1	C	152	ALA	2.8
1	C	50	ALA	2.8
1	C	53	ALA	2.8
1	C	242	GLY	2.8
1	B	61	SER	2.7
1	B	293	PRO	2.7
1	C	56	ILE	2.7
1	B	45	THR	2.7
1	C	213	ASN	2.7
1	C	298	HIS	2.7
1	B	297	HIS	2.6
1	A	291	THR	2.6
1	C	240	LEU	2.6
1	C	86	THR	2.6
1	C	128	PHE	2.6
1	C	297	HIS	2.5
1	C	224	ILE	2.5
1	C	151	ALA	2.5
1	C	54	ALA	2.4
1	C	49	LEU	2.4
1	C	120	VAL	2.4
1	A	234	GLU	2.3
1	A	278	CYS	2.3
1	B	256	SER	2.3
1	B	294	VAL	2.3
1	C	68	THR	2.2
1	C	70	THR	2.2
1	B	295	LEU	2.2
1	C	241	ALA	2.2
1	B	110	ARG	2.2
1	C	288	PHE	2.2
1	C	72	ALA	2.2
1	A	101	ARG	2.1
1	B	201	ARG	2.1
1	C	101	ARG	2.1
1	C	127	LEU	2.1
1	A	279	ASP	2.1
1	B	285	ILE	2.1
1	C	102	TRP	2.1
1	C	219	VAL	2.1
1	C	281	GLY	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	110	ARG	2.0
1	A	140	ARG	2.0
1	C	148	SER	2.0
1	C	105	PHE	2.0
1	C	69	ILE	2.0
1	C	122	ILE	2.0
1	C	150	PRO	2.0
1	C	71	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 [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	GOL	B	401	6/6	0.93	0.09	19,20,22,24	0
2	EDO	A	401	4/4	0.94	0.09	19,24,27,30	0

6.5 Other polymers [i](#)

There are no such residues in this entry.