Full wwPDB X-ray Structure Validation Report (i)

Jun 22, 2024 – 05:26 PM EDT

PDB ID	:	6OA3
Title	:	Structure of human PARG complexed with JA2131
Authors	:	Stegeman, R.A.; Jones, D.E.; Ellenberger, T.; Kim, I.K.; Tainer, J.A.
Deposited on	:	2019-03-15
Resolution	:	1.90 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 (i) 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 (i)) were used in the production of this report:

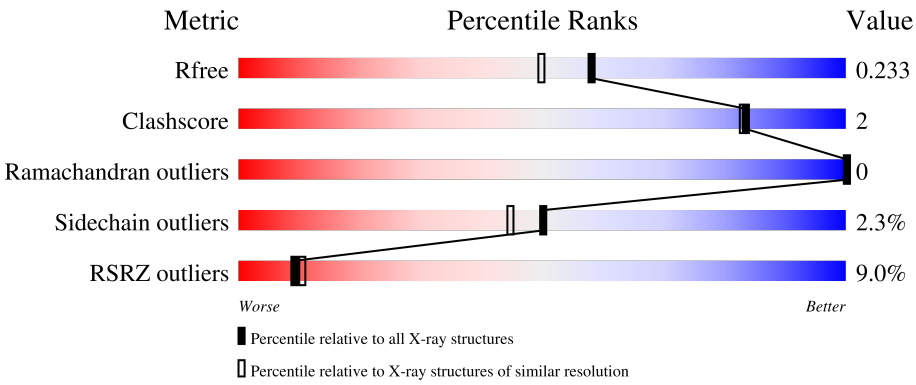
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	2.37.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

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 1.90 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	6207 (1.90-1.90)
Clashscore	141614	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)
RSRZ outliers	127900	6082 (1.90-1.90)

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 <=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	533	8% 85% 7% • 6%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	M0M	A	1001	X	-	-	-

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 4278 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.

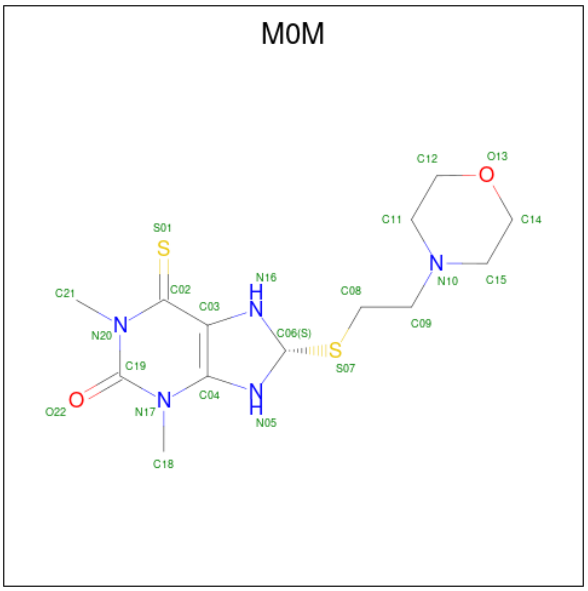
- Molecule 1 is a protein called Poly(ADP-ribose) glycohydrolase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	500	4010	2561	690	735	24	0	0	0

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	444	GLY	-	expression tag	UNP Q86W56
A	445	PRO	-	expression tag	UNP Q86W56
A	446	HIS	-	expression tag	UNP Q86W56
A	447	MET	-	expression tag	UNP Q86W56
A	616	ALA	LYS	engineered mutation	UNP Q86W56
A	617	ALA	GLN	engineered mutation	UNP Q86W56
A	618	ALA	LYS	engineered mutation	UNP Q86W56
A	688	ALA	GLU	engineered mutation	UNP Q86W56
A	689	ALA	LYS	engineered mutation	UNP Q86W56
A	690	ALA	LYS	engineered mutation	UNP Q86W56

- Molecule 2 is (8S)-1,3-dimethyl-8-{[2-(morpholin-4-yl)ethyl]sulfanyl}-6-sulfanylidene-1,3,6,7,8,9-hexahydro-2H-purin-2-one (three-letter code: M0M) (formula: $C_{13}H_{21}N_5O_2S_2$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
2	A	1	22	13	5	2	2	0	0

- Molecule 3 is water.

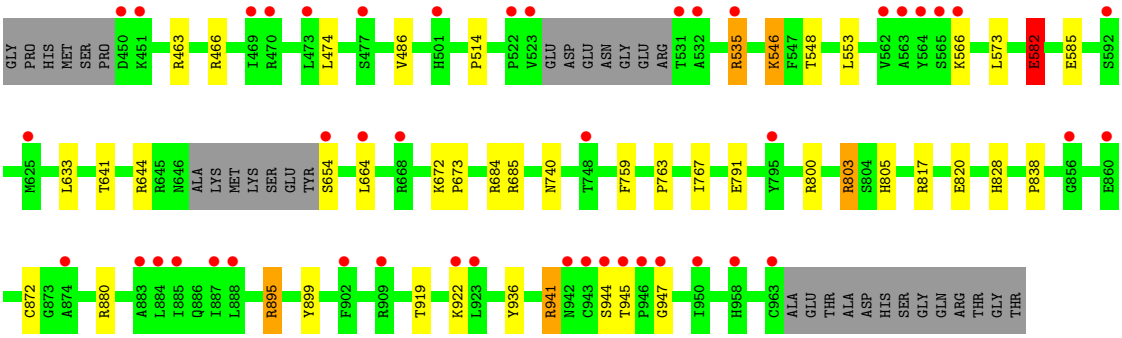
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	A	246	246	246	0	0

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: Poly(ADP-ribose) glycohydrolase

Chain A:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	44.67Å 65.95Å 88.60Å 90.00° 95.44° 90.00°	Depositor
Resolution (Å)	30.00 – 1.90 23.92 – 1.90	Depositor EDS
% Data completeness (in resolution range)	97.1 (30.00-1.90) 97.2 (23.92-1.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.94 (at 1.90Å)	Xtriage
Refinement program	REFMAC 5.8.0222	Depositor
R, R_{free}	0.178 , 0.225 0.187 , 0.233	Depositor DCC
R_{free} test set	1983 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å^2)	24.2	Xtriage
Anisotropy	0.084	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 51.0	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	4278	wwPDB-VP
Average B, all atoms (Å^2)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.20% of the height of the origin peak. No significant pseudotranslation is detected.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: M0M

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	0.86	2/4108 (0.0%)	0.92	10/5573 (0.2%)

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

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	820	GLU	CD-OE1	5.42	1.31	1.25
1	A	582	GLU	CD-OE2	-5.09	1.20	1.25

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	463	ARG	NE-CZ-NH1	8.02	124.31	120.30
1	A	803	ARG	NE-CZ-NH2	-7.59	116.50	120.30
1	A	463	ARG	NE-CZ-NH2	-6.96	116.82	120.30
1	A	817	ARG	NE-CZ-NH1	-6.35	117.13	120.30
1	A	895	ARG	NE-CZ-NH1	6.32	123.46	120.30
1	A	685	ARG	NE-CZ-NH2	-6.26	117.17	120.30
1	A	880	ARG	NE-CZ-NH2	-5.93	117.33	120.30
1	A	899	TYR	CB-CG-CD2	5.70	124.42	121.00
1	A	872	CYS	CB-CA-C	5.67	121.74	110.40
1	A	895	ARG	NE-CZ-NH2	-5.37	117.61	120.30

There are no chirality outliers.

All (6) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	535	ARG	Sidechain
1	A	684	ARG	Sidechain
1	A	800	ARG	Sidechain
1	A	803	ARG	Sidechain
1	A	895	ARG	Sidechain
1	A	941	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	4010	0	3917	19	0
2	A	22	0	0	0	0
3	A	246	0	0	6	0
All	All	4278	0	3917	19	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 2.

All (19) 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:740:ASN:HB2	3:A:1101:HOH:O	1.75	0.87
1:A:546:LYS:HD3	1:A:548:THR:HG23	1.73	0.70
1:A:740:ASN:ND2	3:A:1101:HOH:O	2.22	0.69
1:A:553:LEU:HD23	1:A:573:LEU:HD21	1.74	0.68
1:A:546:LYS:CD	1:A:548:THR:HG23	2.24	0.66
1:A:474:LEU:O	1:A:486:VAL:HG11	2.02	0.60
1:A:791:GLU:HG3	1:A:805:HIS:HB2	1.89	0.54
1:A:945:THR:OG1	1:A:947:GLY:O	2.25	0.54
1:A:740:ASN:CB	3:A:1101:HOH:O	2.45	0.50
1:A:535:ARG:HD3	3:A:1180:HOH:O	2.12	0.50
1:A:936:TYR:CE2	1:A:941:ARG:HD3	2.47	0.49
1:A:838:PRO:HD3	1:A:936:TYR:CD2	2.49	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:759:PHE:O	1:A:763:PRO:HA	2.18	0.44
1:A:919:THR:HG21	3:A:1325:HOH:O	2.17	0.43
1:A:644:ARG:NH1	1:A:644:ARG:HG3	2.33	0.42
1:A:633:LEU:HB3	1:A:767:ILE:HD11	2.01	0.41
1:A:514:PRO:HB3	1:A:641:THR:O	2.20	0.41
1:A:673:PRO:HD3	3:A:1268:HOH:O	2.19	0.41
1:A:582:GLU:HB2	1:A:585:GLU:OE1	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	494/533 (93%)	479 (97%)	15 (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	428/464 (92%)	418 (98%)	10 (2%)	50 45

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	466	ARG
1	A	546	LYS
1	A	566	LYS
1	A	582	GLU
1	A	654	SER
1	A	664	LEU
1	A	672	LYS
1	A	828	HIS
1	A	922	LYS
1	A	944	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	518	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 monosaccharides in this entry.

5.6 Ligand geometry (i)

1 ligand is 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	$\#\|Z\| > 2$
2	M0M	A	1001	-	21,24,24	2.03	7 (33%)	24,34,34	2.95	8 (33%)

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
2	M0M	A	1001	-	1/1/2/4	2/4/22/22	0/3/3/3

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1001	M0M	C03-C04	4.40	1.50	1.36
2	A	1001	M0M	C08-S07	-3.41	1.76	1.81
2	A	1001	M0M	C19-N17	3.27	1.45	1.39
2	A	1001	M0M	C06-N05	-3.10	1.37	1.44
2	A	1001	M0M	C06-N16	-2.92	1.37	1.44
2	A	1001	M0M	C09-N10	2.19	1.52	1.47
2	A	1001	M0M	C04-N05	2.09	1.37	1.33

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	1001	M0M	C06-N05-C04	-11.38	103.24	113.06
2	A	1001	M0M	N20-C19-N17	4.07	122.23	117.14
2	A	1001	M0M	C14-C15-N10	3.67	115.70	110.12
2	A	1001	M0M	C08-S07-C06	2.62	107.81	100.94
2	A	1001	M0M	O22-C19-N17	-2.50	117.88	121.33
2	A	1001	M0M	C18-N17-C19	2.47	121.64	117.33
2	A	1001	M0M	O13-C12-C11	-2.46	106.48	111.77
2	A	1001	M0M	C15-N10-C11	2.06	113.27	108.84

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	A	1001	M0M	C06

All (2) torsion outliers are listed below:

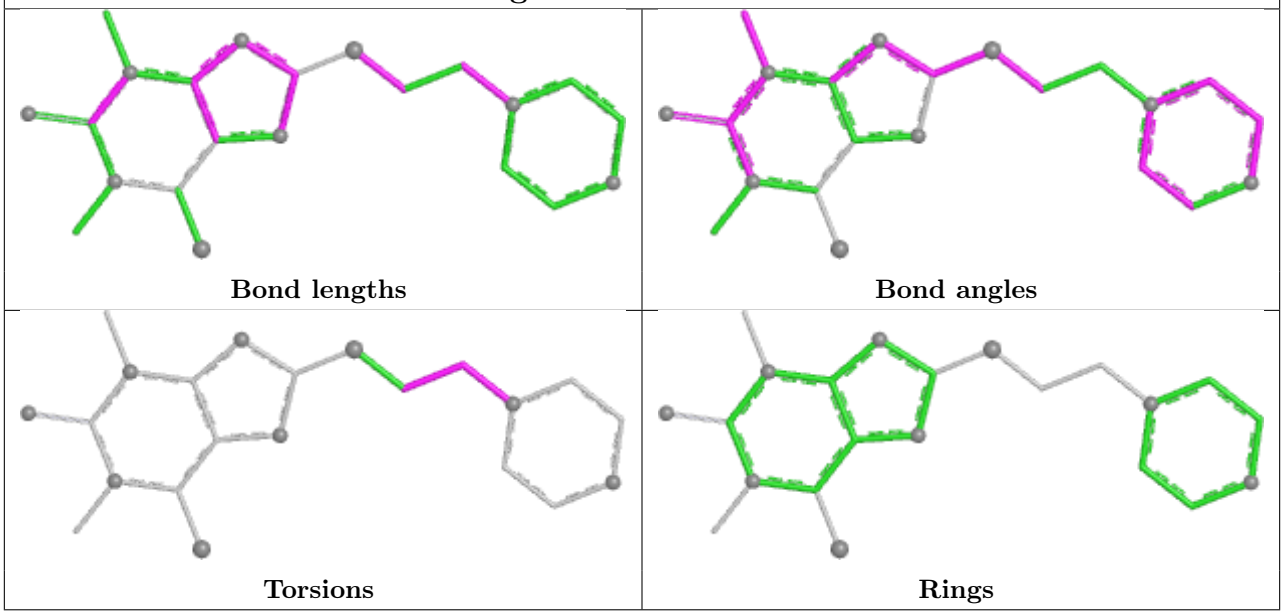
Mol	Chain	Res	Type	Atoms
2	A	1001	M0M	C08-C09-N10-C15
2	A	1001	M0M	S07-C08-C09-N10

There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand M0M A 1001



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, 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	500/533 (93%)	0.34	45 (9%) 9 10	15, 24, 43, 75	20 (4%)

All (45) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	664	LEU	9.1
1	A	946	PRO	6.0
1	A	944	SER	5.4
1	A	950	ILE	4.8
1	A	945	THR	4.6
1	A	625	MET	4.5
1	A	963	CYS	4.2
1	A	473	LEU	3.9
1	A	943	CYS	3.7
1	A	523	VAL	3.6
1	A	450	ASP	3.6
1	A	947	GLY	3.4
1	A	531	THR	3.3
1	A	668	ARG	3.1
1	A	942	ASN	3.0
1	A	522	PRO	3.0
1	A	884	LEU	2.8
1	A	958	HIS	2.8
1	A	654	SER	2.8
1	A	860	GLU	2.7
1	A	451	LYS	2.6
1	A	470	ARG	2.6
1	A	566	LYS	2.5
1	A	856	GLY	2.5
1	A	885	ILE	2.5
1	A	532	ALA	2.5
1	A	563	ALA	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	565	SER	2.4
1	A	535	ARG	2.4
1	A	909	ARG	2.3
1	A	469	ILE	2.3
1	A	501	HIS	2.3
1	A	592	SER	2.3
1	A	795	TYR	2.3
1	A	748	THR	2.3
1	A	923	LEU	2.2
1	A	564	TYR	2.1
1	A	902	PHE	2.1
1	A	562	VAL	2.1
1	A	477	SER	2.1
1	A	887	ILE	2.1
1	A	874	ALA	2.1
1	A	883	ALA	2.1
1	A	888	LEU	2.0
1	A	922	LYS	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)

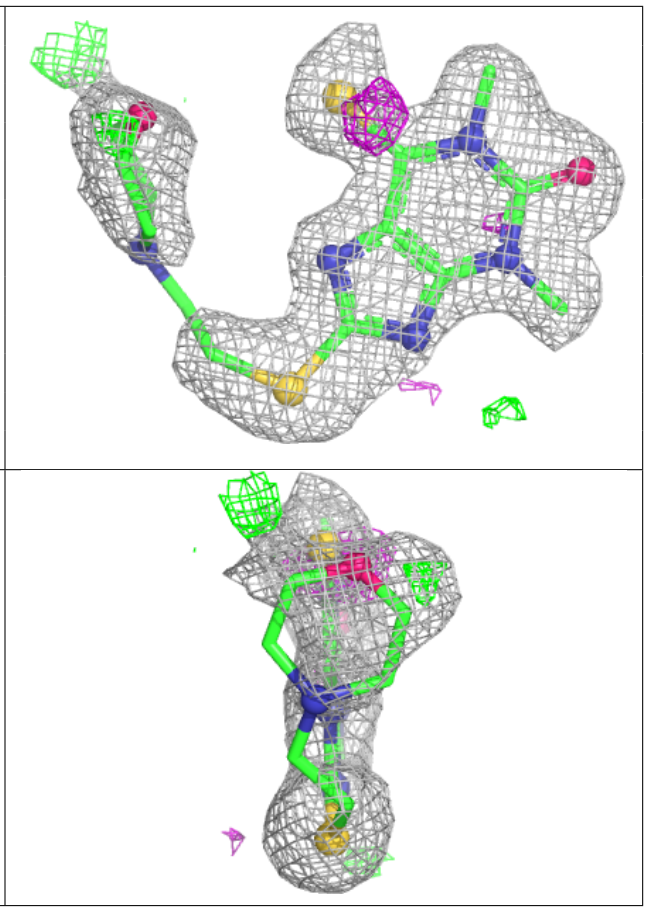
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	M0M	A	1001	22/22	0.84	0.20	31,39,68,70	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around M0M A 1001:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



6.5 Other polymers (i)

There are no such residues in this entry.