



wwPDB X-ray Structure Validation Summary Report ⓘ

Dec 22, 2025 – 12:13 PM EST

PDB ID : 9YUD / pdb_00009yud
Title : Re-Refined Human Phosphodiesterase 3B complexed with GSK4394835A
Authors : Eaton, S.A.; Christianson, D.W.
Deposited on : 2025-10-22
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
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
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) : 2.47

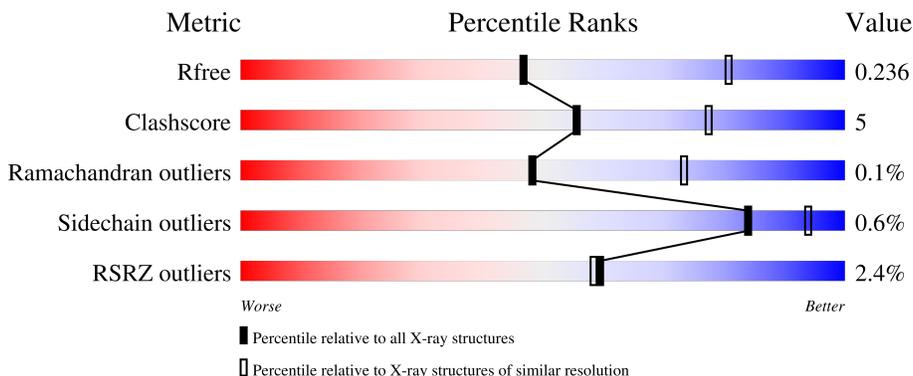
1 Overall quality at a glance

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}	164625	3333 (2.70-2.70)
Clashscore	180529	3684 (2.70-2.70)
Ramachandran outliers	177936	3633 (2.70-2.70)
Sidechain outliers	177891	3633 (2.70-2.70)
RSRZ outliers	164620	3333 (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	443	 3% 69% 11% 20%
1	B	443	 3% 72% 8% 20%

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 5527 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 cGMP-inhibited 3',5'-cyclic phosphodiesterase 3B.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	355	2733	1766	452	501	14	0	0	0
1	B	354	2708	1752	460	482	14	0	0	0

There are 54 discrepancies between the modelled and reference sequences:

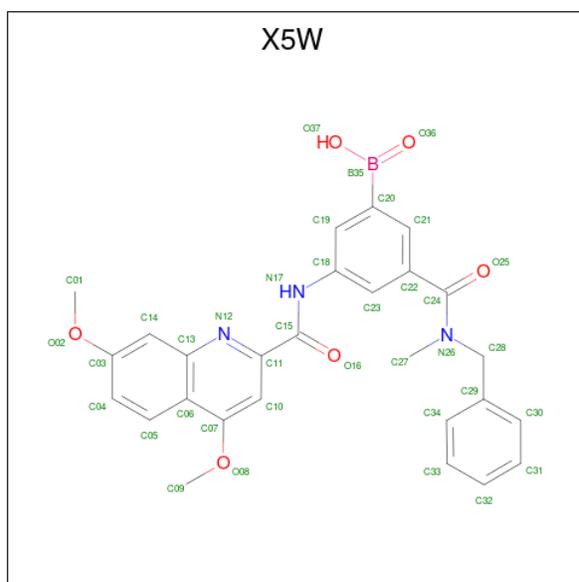
Chain	Residue	Modelled	Actual	Comment	Reference
A	653	MET	-	initiating methionine	UNP Q13370
A	691	ASP	LYS	engineered mutation	UNP Q13370
A	783	ASP	ARG	engineered mutation	UNP Q13370
A	831	GLU	ALA	engineered mutation	UNP Q13370
A	880	GLU	LYS	engineered mutation	UNP Q13370
A	981	ASP	SER	engineered mutation	UNP Q13370
A	1075	ASN	-	expression tag	UNP Q13370
A	1076	LEU	-	expression tag	UNP Q13370
A	1077	TYR	-	expression tag	UNP Q13370
A	1078	PHE	-	expression tag	UNP Q13370
A	1079	GLN	-	expression tag	UNP Q13370
A	1080	GLY	-	expression tag	UNP Q13370
A	1081	ASP	-	expression tag	UNP Q13370
A	1082	TYR	-	expression tag	UNP Q13370
A	1083	LYS	-	expression tag	UNP Q13370
A	1084	ASP	-	expression tag	UNP Q13370
A	1085	ASP	-	expression tag	UNP Q13370
A	1086	ASP	-	expression tag	UNP Q13370
A	1087	ASP	-	expression tag	UNP Q13370
A	1088	LYS	-	expression tag	UNP Q13370
A	1089	GLY	-	expression tag	UNP Q13370
A	1090	HIS	-	expression tag	UNP Q13370
A	1091	HIS	-	expression tag	UNP Q13370
A	1092	HIS	-	expression tag	UNP Q13370
A	1093	HIS	-	expression tag	UNP Q13370

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Chain	Residue	Modelled	Actual	Comment	Reference
A	1094	HIS	-	expression tag	UNP Q13370
A	1095	HIS	-	expression tag	UNP Q13370
B	653	MET	-	initiating methionine	UNP Q13370
B	691	ASP	LYS	engineered mutation	UNP Q13370
B	783	ASP	ARG	engineered mutation	UNP Q13370
B	831	GLU	ALA	engineered mutation	UNP Q13370
B	880	GLU	LYS	engineered mutation	UNP Q13370
B	981	ASP	SER	engineered mutation	UNP Q13370
B	1075	ASN	-	expression tag	UNP Q13370
B	1076	LEU	-	expression tag	UNP Q13370
B	1077	TYR	-	expression tag	UNP Q13370
B	1078	PHE	-	expression tag	UNP Q13370
B	1079	GLN	-	expression tag	UNP Q13370
B	1080	GLY	-	expression tag	UNP Q13370
B	1081	ASP	-	expression tag	UNP Q13370
B	1082	TYR	-	expression tag	UNP Q13370
B	1083	LYS	-	expression tag	UNP Q13370
B	1084	ASP	-	expression tag	UNP Q13370
B	1085	ASP	-	expression tag	UNP Q13370
B	1086	ASP	-	expression tag	UNP Q13370
B	1087	ASP	-	expression tag	UNP Q13370
B	1088	LYS	-	expression tag	UNP Q13370
B	1089	GLY	-	expression tag	UNP Q13370
B	1090	HIS	-	expression tag	UNP Q13370
B	1091	HIS	-	expression tag	UNP Q13370
B	1092	HIS	-	expression tag	UNP Q13370
B	1093	HIS	-	expression tag	UNP Q13370
B	1094	HIS	-	expression tag	UNP Q13370
B	1095	HIS	-	expression tag	UNP Q13370

- Molecule 2 is [3-[(4,7-dimethoxyquinolin-2-yl)carbonylamino]-5-[methyl-(phenylmethyl)carbamoyl]phenyl]-oxidanyl-oxidanylidene-boron (CCD ID: X5W) (formula: C₂₇H₂₅BN₃O₆) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	B	C	N	O		
2	A	1	37	1	27	3	6	0	0

- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
3	A	2	2	2	0	0
3	B	2	2	2	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
4	A	22	22	22	0	0
4	B	23	23	23	0	0

4 Data and refinement statistics i

Property	Value	Source
Space group	P 41	Depositor
Cell constants a, b, c, α , β , γ	78.59Å 78.59Å 166.34Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	71.06 – 2.70 71.06 – 2.70	Depositor EDS
% Data completeness (in resolution range)	65.7 (71.06-2.70) 65.7 (71.06-2.70)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.92 (at 2.69Å)	Xtrriage
Refinement program	PHENIX (1.19.2-4158)	Depositor
R, R_{free}	0.187 , 0.238 0.189 , 0.236	Depositor DCC
R_{free} test set	841 reflections (3.05%)	wwPDB-VP
Wilson B-factor (Å ²)	55.3	Xtrriage
Anisotropy	0.002	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 47.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	0.063 for h,-k,-l	Xtrriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	5527	wwPDB-VP
Average B, all atoms (Å ²)	49.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.86% 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: MG, X5W

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	0.32	3/2810 (0.1%)	0.31	1/3845 (0.0%)
1	B	0.08	0/2784	0.23	0/3809
All	All	0.23	3/5594 (0.1%)	0.27	1/7654 (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	1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	737	HIS	C-N	11.57	1.43	1.33
1	A	736	TYR	C-N	7.28	1.43	1.33
1	A	737	HIS	CG-ND1	-5.13	1.32	1.38

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	737	HIS	O-C-N	-5.71	114.30	122.29

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	737	HIS	Mainchain

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	2733	0	2471	28	0
1	B	2708	0	2467	23	0
2	A	37	0	0	2	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
4	A	22	0	0	0	0
4	B	23	0	0	0	0
All	All	5527	0	4938	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 5.

The worst 5 of 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:A:911:ASP:HB3	1:A:914:SER:HB3	1.66	0.78
1:B:911:ASP:HB3	1:B:914:SER:HB3	1.73	0.70
1:B:953:GLU:O	1:B:957:ASN:ND2	2.28	0.66
1:B:942:ALA:HB1	1:B:1061:LEU:HB2	1.77	0.66
1:A:942:ALA:HB1	1:A:1061:LEU:HB2	1.80	0.64

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	349/443 (79%)	338 (97%)	10 (3%)	1 (0%)	37	61
1	B	348/443 (79%)	338 (97%)	10 (3%)	0	100	100
All	All	697/886 (79%)	676 (97%)	20 (3%)	1 (0%)	48	73

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	737	HIS

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	268/392 (68%)	265 (99%)	3 (1%)	70	87
1	B	261/392 (67%)	261 (100%)	0	100	100
All	All	529/784 (68%)	526 (99%)	3 (1%)	84	94

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	685	VAL
1	A	739	ARG
1	A	988	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 6 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	698	GLN
1	B	705	GLN
1	B	994	HIS
1	A	957	ASN
1	A	840	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](#)

Of 5 ligands modelled in this entry, 4 are monoatomic - leaving 1 for Mogul analysis.

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	X5W	A	1101	3,1	37,40,40	1.85	6 (16%)	52,56,56	1.47	7 (13%)

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	X5W	A	1101	3,1	-	0/26/28/28	0/4/4/4

The worst 5 of 6 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1101	X5W	C24-N26	7.44	1.47	1.34
2	A	1101	X5W	C15-N17	3.55	1.46	1.35
2	A	1101	X5W	C06-C13	-3.32	1.37	1.42
2	A	1101	X5W	C13-N12	-2.66	1.33	1.37

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1101	X5W	C22-C24	2.57	1.54	1.50

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1101	X5W	O08-C07-C06	5.69	121.28	114.56
2	A	1101	X5W	C22-C24-N26	2.93	123.86	118.92
2	A	1101	X5W	C22-C21-C20	-2.51	119.88	121.41
2	A	1101	X5W	C29-C28-N26	-2.43	108.44	113.02
2	A	1101	X5W	C18-C19-C20	-2.34	120.16	121.46

There are no chirality outliers.

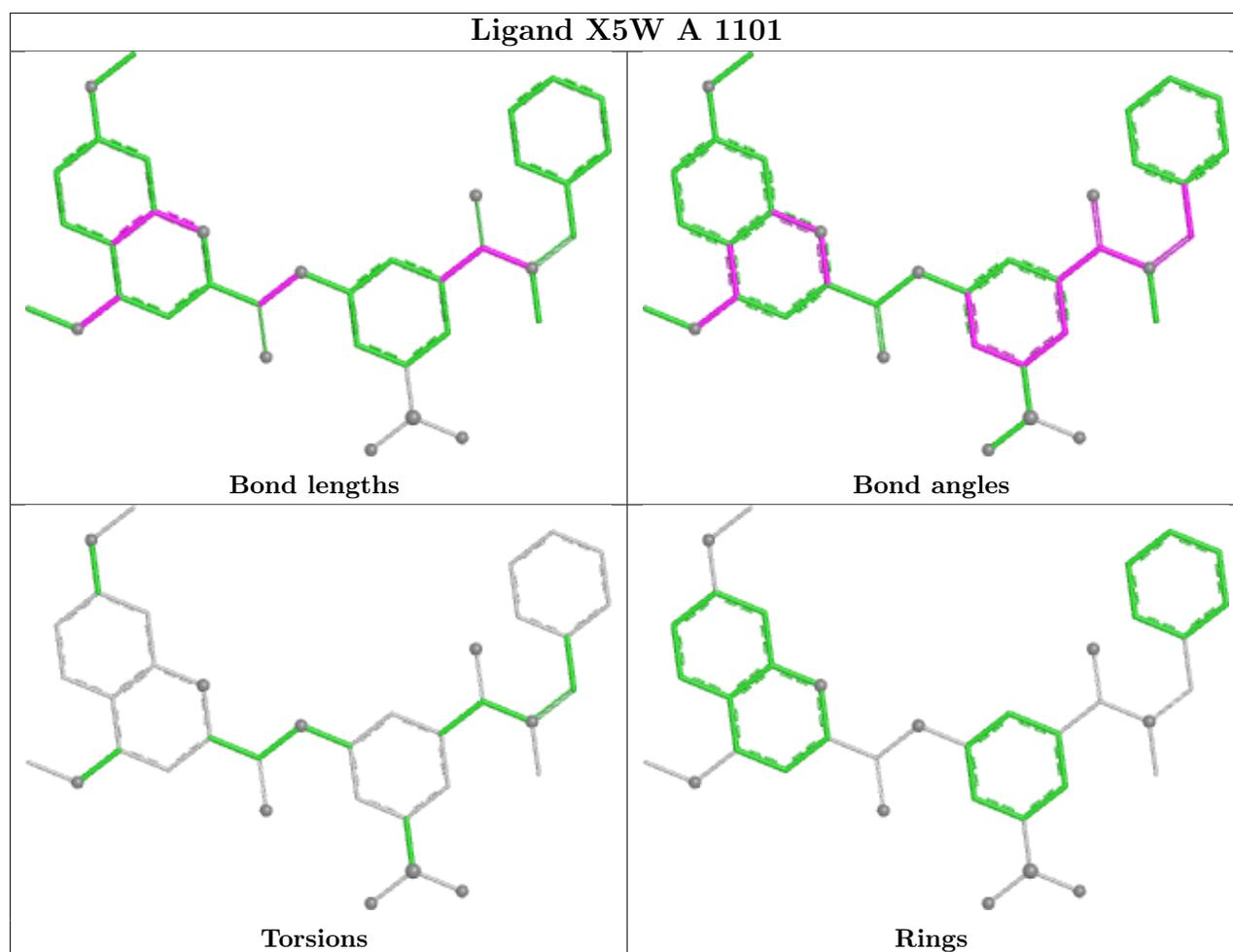
There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1101	X5W	2	0

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 than 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.



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	355/443 (80%)	-0.20	5 (1%) 73 73	27, 45, 70, 101	0
1	B	354/443 (79%)	-0.09	12 (3%) 48 46	25, 49, 90, 125	0
All	All	709/886 (80%)	-0.15	17 (2%) 59 58	25, 47, 80, 125	0

The worst 5 of 17 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	915	ASN	3.6
1	B	1011	GLY	3.5
1	B	763	ILE	3.3
1	B	765	ASN	3.1
1	A	664	VAL	3.0

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](#)

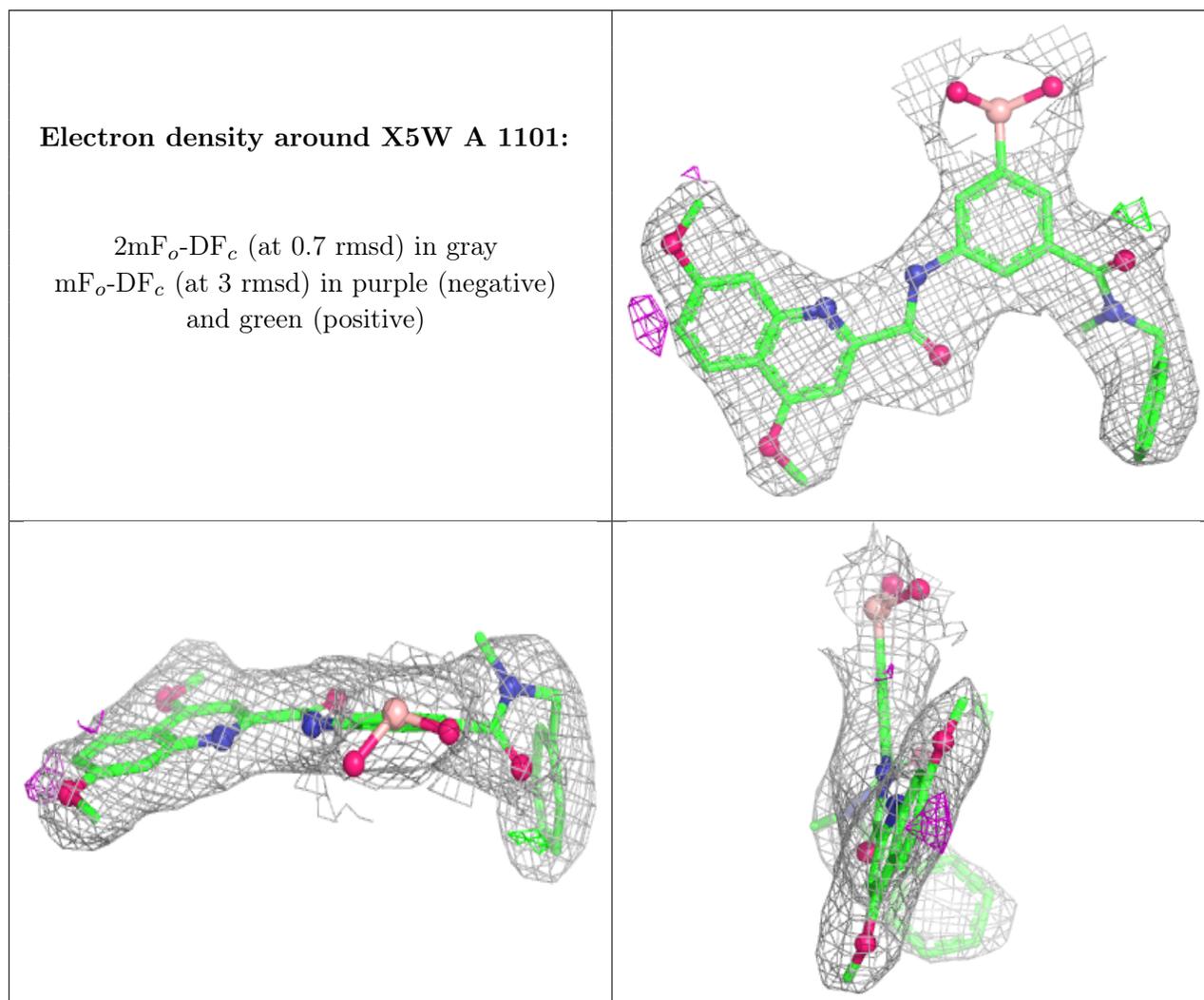
There are no oligosaccharides in this entry.

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(\AA^2)	Q<0.9
2	X5W	A	1101	37/37	0.94	0.10	31,43,57,58	0
3	MG	B	1101	1/1	0.99	0.08	18,18,18,18	0
3	MG	B	1102	1/1	0.99	0.04	30,30,30,30	0
3	MG	A	1102	1/1	1.00	0.07	23,23,23,23	0
3	MG	A	1103	1/1	1.00	0.04	22,22,22,22	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.



6.5 Other polymers [\(i\)](#)

There are no such residues in this entry.