



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 2, 2026 – 03:24 AM UTC

PDB ID : 4OON / pdb_00004oon
Title : Crystal structure of PBP1a in complex with compound 17 ((4Z,8S,11E,14S)-5-(2-amino-1,3-thiazol-4-yl)-14-(5,6-dihydroxy-1,3-dioxo-1,3-dihydro-2H-isoindol-2-yl)-8-formyl-2-methyl-6-oxo-3,10-dioxo-4,7,11-triazatetradeca-4,11-diene-2,12,14-tricarboxylic acid)
Authors : Han, S.; Caspers, N.; Knafels, J.D.
Deposited on : 2014-02-03
Resolution : 3.20 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](#) ①) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtrriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
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

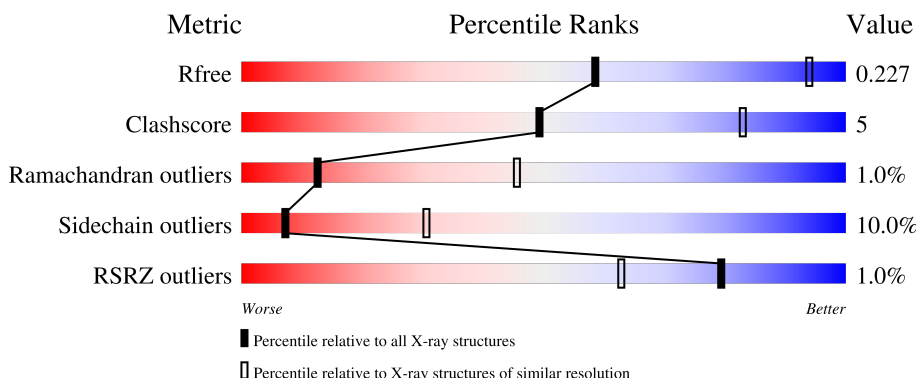
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.20 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	1466 (3.20-3.20)
Clashscore	190562	1573 (3.20-3.20)
Ramachandran outliers	187476	1548 (3.20-3.20)
Sidechain outliers	187428	1547 (3.20-3.20)
RSRZ outliers	180081	1466 (3.20-3.20)

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	795	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3959 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.

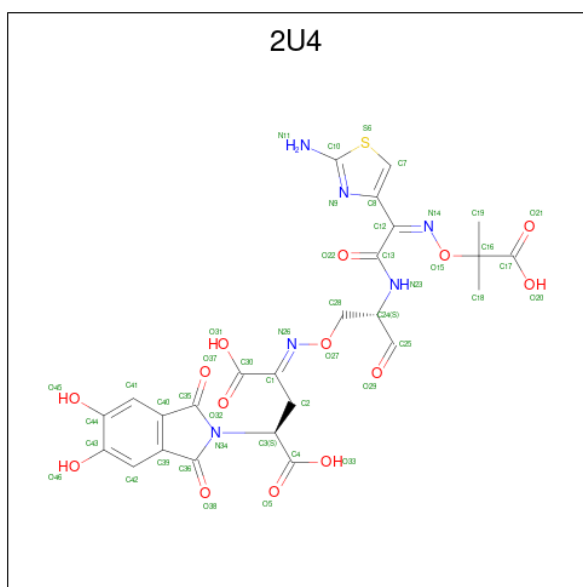
- Molecule 1 is a protein called Penicillin-binding protein 1A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	502	3911	2470	688	737	16	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	28	MET	-	initiating methionine	UNP Q07806
A	29	SER	-	expression tag	UNP Q07806
A	30	HIS	-	expression tag	UNP Q07806
A	31	HIS	-	expression tag	UNP Q07806
A	32	HIS	-	expression tag	UNP Q07806
A	33	HIS	-	expression tag	UNP Q07806
A	34	HIS	-	expression tag	UNP Q07806
A	35	HIS	-	expression tag	UNP Q07806

- Molecule 2 is (4Z,8S,11E,14S)-5-(2-amino-1,3-thiazol-4-yl)-14-(5,6-dihydroxy-1,3-dioxo-1,3-dihydro-2H-isoindol-2-yl)-8-formyl-2-methyl-6-oxo-3,10-dioxo-4,7,11-triazatetradeca-4,11-diene-2,12,14-tricarboxylic acid (CCD ID: 2U4) (formula: C₂₅H₂₄N₆O₁₄S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
2	A	1	46	25	6	14	1	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	2	Total	O	0	0
			2	2		

4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	113.77Å 113.77Å 123.46Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	27.72 – 3.20 27.72 – 3.20	Depositor EDS
% Data completeness (in resolution range)	100.0 (27.72-3.20) 99.8 (27.72-3.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.32 (at 3.19Å)	Xtrriage
Refinement program	BUSTER	Depositor
R, R_{free}	0.168 , 0.216 0.188 , 0.227	Depositor DCC
R_{free} test set	695 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å ²)	86.5	Xtrriage
Anisotropy	0.374	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 74.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	3959	wwPDB-VP
Average B, all atoms (Å ²)	81.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.89% 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: 2U4

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	0.87	0/3997	1.36	24/5413 (0.4%)

There are no bond length outliers.

All (24) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	492	GLU	N-CA-C	9.17	127.52	108.53
1	A	444	PHE	N-CA-C	-8.56	101.45	112.23
1	A	711	ASN	N-CA-C	-7.66	98.81	108.45
1	A	445	GLU	CB-CG-CD	7.21	124.87	112.60
1	A	508	LEU	CA-C-N	6.17	132.81	121.70
1	A	508	LEU	C-N-CA	6.17	132.81	121.70
1	A	707	PHE	CA-CB-CG	-5.92	107.88	113.80
1	A	54	ASP	CA-CB-CG	5.65	118.25	112.60
1	A	260	ASN	CA-CB-CG	5.57	118.17	112.60
1	A	692	LEU	N-CA-C	5.45	118.50	109.46
1	A	710	TYR	CA-C-N	5.44	131.56	122.20
1	A	710	TYR	C-N-CA	5.44	131.56	122.20
1	A	511	ILE	N-CA-C	5.31	115.02	109.01
1	A	401	ASP	CA-CB-CG	5.27	117.87	112.60
1	A	282	THR	CA-C-N	5.20	131.47	121.54
1	A	282	THR	C-N-CA	5.20	131.47	121.54
1	A	334	HIS	CA-C-N	5.09	127.61	120.28
1	A	334	HIS	C-N-CA	5.09	127.61	120.28
1	A	791	ASN	CA-C-N	5.08	130.84	121.70
1	A	791	ASN	C-N-CA	5.08	130.84	121.70
1	A	725	PRO	CA-C-N	5.07	130.89	121.62
1	A	725	PRO	C-N-CA	5.07	130.89	121.62
1	A	710	TYR	N-CA-C	5.06	114.50	107.73
1	A	396	VAL	N-CA-C	5.02	116.90	111.58

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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	3911	0	3868	42	0
2	A	46	0	18	0	0
3	A	2	0	0	0	0
All	All	3959	0	3886	42	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.

All (42) 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:384:ASN:HD21	1:A:730:ARG:H	1.32	0.77
1:A:430:PRO:HG3	1:A:715:VAL:HG23	1.71	0.72
1:A:564:VAL:HG23	1:A:569:ILE:HD11	1.71	0.71
1:A:296:GLN:HE22	1:A:438:LEU:H	1.39	0.69
1:A:483:ASN:HA	1:A:510:PRO:HA	1.75	0.68
1:A:339:ARG:HH22	1:A:445:GLU:HA	1.58	0.68
1:A:372:ASP:HA	1:A:375:LYS:HD2	1.77	0.66
1:A:537:ALA:O	1:A:541:ILE:HG12	1.97	0.65
1:A:433:GLY:O	1:A:585:PRO:HA	1.98	0.64
1:A:512:PRO:HG2	1:A:515:GLU:HB2	1.83	0.60
1:A:320:GLU:HB2	1:A:402:GLN:HG2	1.82	0.60
1:A:316:TYR:HA	1:A:417:GLN:HE22	1.67	0.60
1:A:48:LEU:O	1:A:60:GLU:HA	2.07	0.54
1:A:564:VAL:CG2	1:A:569:ILE:HD11	2.37	0.54
1:A:303:VAL:HG13	1:A:423:SER:HB3	1.91	0.53
1:A:713:ASP:OD1	1:A:756:HIS:HD2	1.92	0.53
1:A:323:LEU:HD22	1:A:326:GLN:HE22	1.75	0.52
1:A:591:ILE:HB	1:A:600:TYR:HB3	1.93	0.51
1:A:264:ILE:HG13	1:A:291:VAL:HG11	1.92	0.51
1:A:578:ASN:HB2	1:A:607:VAL:HG11	1.93	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:357:ILE:HG13	1:A:369:VAL:HB	1.95	0.49
1:A:674:ASP:HA	1:A:677:LYS:HB2	1.93	0.49
1:A:515:GLU:HA	1:A:518:TYR:CE2	2.49	0.47
1:A:768:ARG:HD2	1:A:784:ALA:HB1	1.97	0.47
1:A:301:GLN:HG2	1:A:305:ASP:OD2	2.15	0.47
1:A:465:PRO:HG3	1:A:672:LEU:HD21	1.97	0.46
1:A:322:ARG:C	1:A:324:PRO:HD3	2.40	0.45
1:A:758:MET:HE2	1:A:761:PRO:HD3	1.97	0.45
1:A:518:TYR:HA	1:A:675:VAL:HG22	1.99	0.45
1:A:486:PRO:HA	1:A:523:MET:HE2	1.99	0.45
1:A:506:THR:HG21	1:A:523:MET:HG2	1.99	0.45
1:A:426:ILE:HD12	1:A:438:LEU:HD12	1.99	0.44
1:A:661:ASP:HB3	1:A:664:THR:OG1	2.17	0.44
1:A:768:ARG:HG2	1:A:786:PHE:CZ	2.52	0.44
1:A:262:PRO:HB2	1:A:444:PHE:CG	2.53	0.42
1:A:290:THR:HB	1:A:434:ALA:HB1	2.01	0.42
1:A:405:VAL:HB	1:A:413:LEU:HD22	2.01	0.42
1:A:708:SER:HG	1:A:717:SER:HG	1.67	0.42
1:A:427:SER:HA	1:A:715:VAL:O	2.19	0.41
1:A:351:GLN:HB2	1:A:358:MET:HB2	2.03	0.41
1:A:593:SER:HB3	1:A:599:LEU:HD12	2.02	0.40
1:A:768:ARG:HG2	1:A:786:PHE:CE1	2.56	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	494/795 (62%)	463 (94%)	26 (5%)	5 (1%)	12 45

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	508	LEU
1	A	283	GLU
1	A	377	ALA
1	A	507	PHE
1	A	791	ASN

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	411/657 (63%)	370 (90%)	41 (10%)	7 30

All (41) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	53	GLU
1	A	260	ASN
1	A	266	GLU
1	A	279	GLU
1	A	287	VAL
1	A	321	THR
1	A	326	GLN
1	A	332	LEU
1	A	335	LEU
1	A	344	LEU
1	A	345	GLU
1	A	354	LYS
1	A	361	THR
1	A	372	ASP
1	A	382	SER
1	A	403	ILE
1	A	409	GLU
1	A	417	GLN
1	A	443	SER
1	A	445	GLU
1	A	488	VAL
1	A	492	GLU

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Mol	Chain	Res	Type
1	A	494	LEU
1	A	507	PHE
1	A	513	LEU
1	A	532	LEU
1	A	595	ASP
1	A	599	LEU
1	A	609	VAL
1	A	680	THR
1	A	700	ASN
1	A	701	ASP
1	A	708	SER
1	A	730	ARG
1	A	731	ARG
1	A	757	THR
1	A	765	VAL
1	A	766	SER
1	A	767	LEU
1	A	768	ARG
1	A	776	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	296	GLN
1	A	312	GLN
1	A	326	GLN
1	A	384	ASN
1	A	408	GLN
1	A	448	ASN
1	A	474	ASN
1	A	483	ASN
1	A	673	GLN
1	A	756	HIS

5.3.3 RNA

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](#)

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	2U4	A	901	1	44,48,48	1.15	4 (9%)	59,70,70	2.78	21 (35%)

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	2U4	A	901	1	-	10/46/64/64	0/3/3/3

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	901	2U4	O31-C30	-3.05	1.22	1.30
2	A	901	2U4	C8-N9	-2.44	1.33	1.38
2	A	901	2U4	O33-C4	-2.32	1.23	1.30
2	A	901	2U4	C10-N11	2.04	1.38	1.34

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	901	2U4	C16-O15-N14	10.34	119.45	110.35
2	A	901	2U4	O27-N26-C1	9.81	126.13	111.47
2	A	901	2U4	O15-N14-C12	6.69	122.18	111.76
2	A	901	2U4	S6-C10-N9	-5.42	110.27	114.54
2	A	901	2U4	C10-N9-C8	4.47	117.13	110.57
2	A	901	2U4	S6-C10-N11	4.25	125.93	120.99
2	A	901	2U4	C28-O27-N26	3.11	111.70	108.33
2	A	901	2U4	C12-C13-N23	3.03	119.05	114.27
2	A	901	2U4	C39-C40-C35	-2.95	105.67	108.26
2	A	901	2U4	C40-C35-N34	2.90	109.16	105.96
2	A	901	2U4	C2-C3-N34	2.74	115.90	112.34
2	A	901	2U4	C42-C39-C36	2.71	134.04	129.39
2	A	901	2U4	C41-C40-C35	2.58	133.81	129.39
2	A	901	2U4	C4-C3-N34	-2.50	106.26	111.00
2	A	901	2U4	O33-C4-C3	2.45	121.32	113.34
2	A	901	2U4	C19-C16-C18	-2.41	105.44	110.73
2	A	901	2U4	O37-C35-C40	-2.36	124.09	128.66
2	A	901	2U4	O38-C36-C39	-2.32	124.16	128.66
2	A	901	2U4	C40-C39-C36	-2.31	106.23	108.26
2	A	901	2U4	C39-C36-N34	2.20	108.39	105.96
2	A	901	2U4	C30-C1-N26	-2.16	112.25	114.71

There are no chirality outliers.

All (10) torsion outliers are listed below:

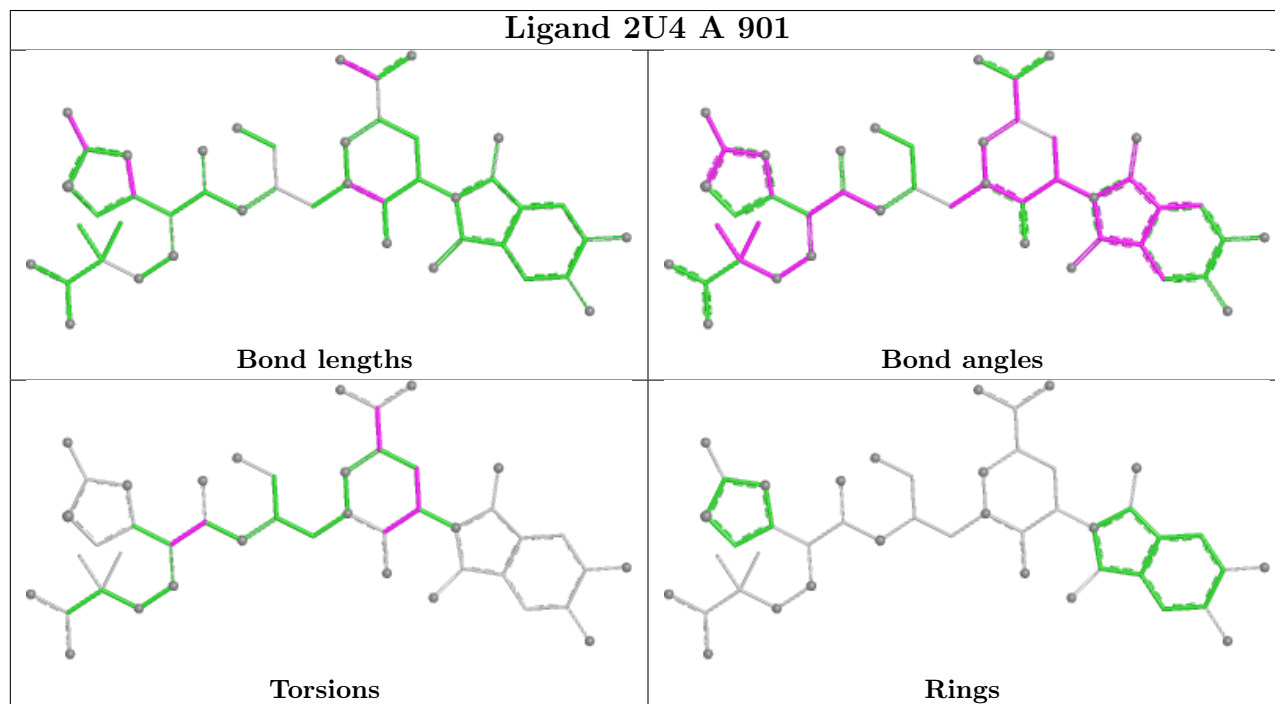
Mol	Chain	Res	Type	Atoms
2	A	901	2U4	C2-C1-C30-O31
2	A	901	2U4	N26-C1-C30-O31
2	A	901	2U4	N26-C1-C30-O32
2	A	901	2U4	N34-C3-C4-O33
2	A	901	2U4	N14-C12-C13-O22
2	A	901	2U4	C1-C2-C3-N34
2	A	901	2U4	C8-C12-C13-O22
2	A	901	2U4	N14-C12-C13-N23
2	A	901	2U4	N34-C3-C4-O5
2	A	901	2U4	C8-C12-C13-N23

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 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	502/795 (63%)	-0.49	5 (0%) 79 63	51, 79, 106, 138	0

All (5) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	494	LEU	4.3
1	A	493	TYR	3.7
1	A	47	PRO	2.5
1	A	506	THR	2.2
1	A	792	GLU	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 oligosaccharides in this entry.

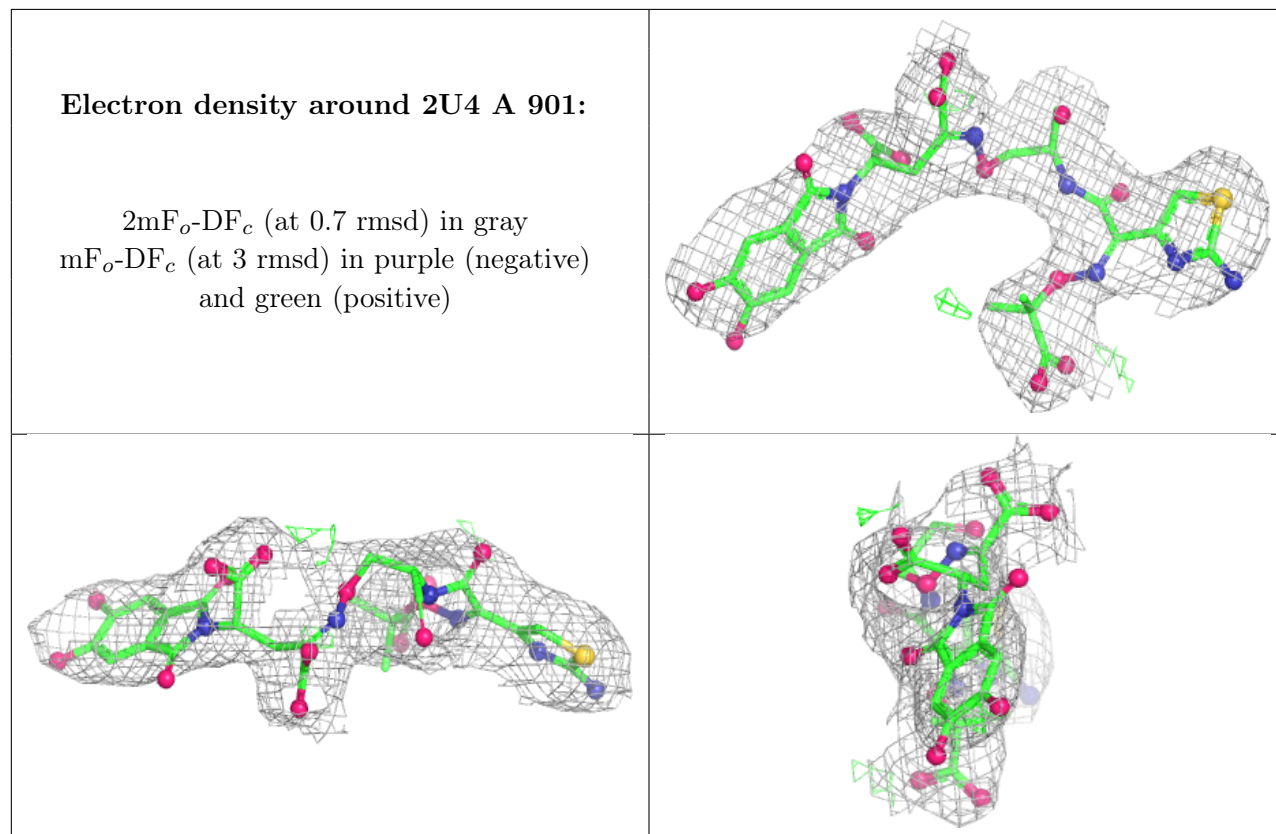
6.4 Ligands [i](#)

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(Å ²)	Q<0.9
2	2U4	A	901	46/46	0.93	0.09	69,101,122,125	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.