



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 19, 2026 – 03:29 AM UTC

PDB ID : 6LLZ / pdb_00006llz
Title : Crystal Structure of Fagopyrum esculentum M UGT708C1 complexed with UDP-glucose
Authors : Wang, X.; Liu, M.
Deposited on : 2019-12-24
Resolution : 2.01 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 : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (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

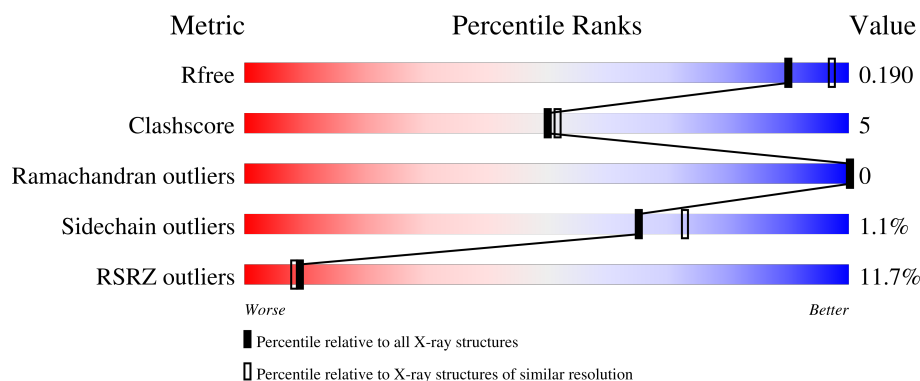
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.01 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	10052 (2.00-2.00)
Clashscore	190562	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (2.00-2.00)
RSRZ outliers	180081	10067 (2.00-2.00)

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	457	9% 85% 9% .. 5%
1	B	457	13% 83% 10% .. 5%

2 Entry composition [i](#)

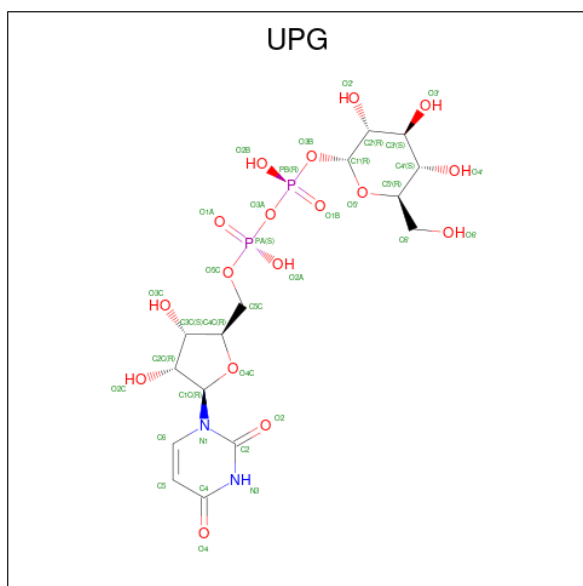
There are 3 unique types of molecules in this entry. The entry contains 7308 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 UDP-glycosyltransferase 708C1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	436	Total	C	N	O	S	0	0	0
			3383	2171	568	630	14			
1	B	436	Total	C	N	O	S	0	0	0
			3387	2174	569	630	14			

- Molecule 2 is URIDINE-5'-DIPHOSPHATE-GLUCOSE (CCD ID: UPG) (formula: $C_{15}H_{24}N_2O_{17}P_2$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			36	15	2	17	2		
2	B	1	Total	C	N	O	P	0	0
			36	15	2	17	2		

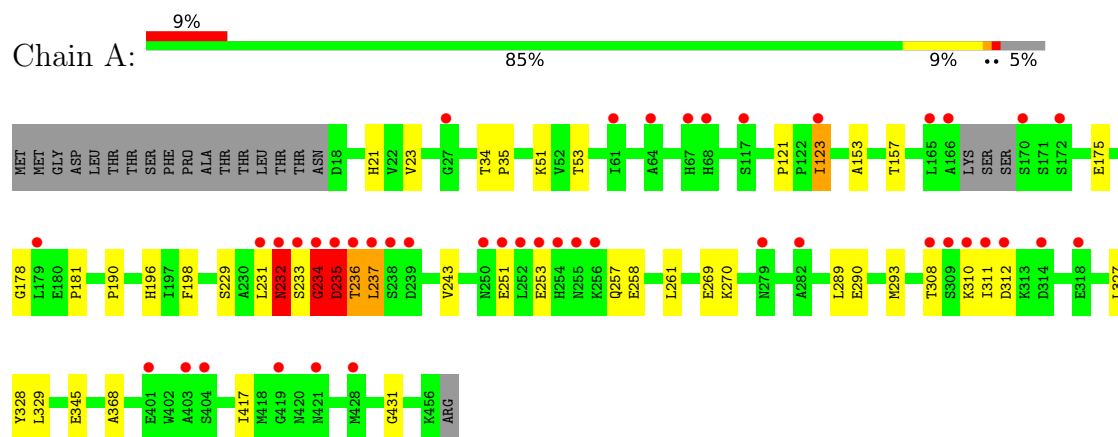
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	250	Total 250	O 250	0	0
3	B	216	Total 216	O 216	0	0

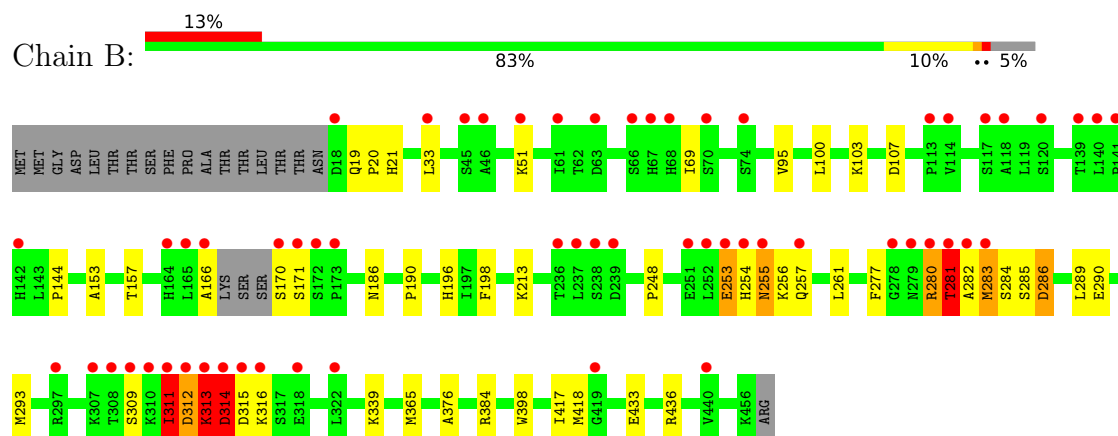
3 Residue-property plots [i](#)

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: UDP-glycosyltransferase 708C1



• Molecule 1: UDP-glycosyltransferase 708C1



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	98.91Å 143.76Å 69.76Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 2.01 50.00 – 2.01	Depositor EDS
% Data completeness (in resolution range)	98.9 (50.00-2.01) 98.8 (50.00-2.01)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.71 (at 1.98Å)	Xtriage
Refinement program	PHENIX 1.11.1 _2575	Depositor
R, R_{free}	0.168 , 0.202 0.188 , 0.190	Depositor DCC
R_{free} test set	3472 reflections (4.94%)	wwPDB-VP
Wilson B-factor (Å ²)	18.5	Xtriage
Anisotropy	0.116	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 53.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	7308	wwPDB-VP
Average B, all atoms (Å ²)	35.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.51% 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

5.1 Standard geometry

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

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	0.53	5/3476 (0.1%)	0.69	6/4735 (0.1%)
1	B	0.57	5/3480 (0.1%)	0.75	7/4739 (0.1%)
All	All	0.55	10/6956 (0.1%)	0.72	13/9474 (0.1%)

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	3
1	B	0	2
All	All	0	5

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	417	ILE	C-O	-6.62	1.16	1.24
1	B	285	SER	C-O	-6.20	1.16	1.24
1	A	229	SER	C-O	-5.75	1.17	1.24
1	B	286	ASP	C-O	-5.55	1.17	1.24
1	A	329	LEU	C-O	-5.42	1.17	1.24
1	B	417	ILE	C-O	-5.37	1.17	1.24
1	A	327	LEU	C-O	-5.30	1.17	1.24
1	B	283	MET	C-O	-5.22	1.17	1.23
1	B	418	MET	C-O	-5.08	1.17	1.24
1	A	328	TYR	C-O	-5.05	1.18	1.24

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	234	GLY	N-CA-C	-17.41	87.05	112.81
1	B	313	LYS	N-CA-C	-14.65	89.35	110.59
1	B	314	ASP	N-CA-C	11.30	126.24	109.07
1	B	284	SER	N-CA-CB	-11.08	93.54	110.49
1	A	235	ASP	N-CA-C	-10.98	91.75	109.76
1	B	283	MET	CB-CA-C	-8.61	94.96	109.50
1	B	311	ILE	N-CA-C	-7.16	97.29	107.75
1	B	281	THR	N-CA-C	6.45	117.97	111.07
1	A	123	ILE	CA-CB-CG1	6.31	121.12	110.40
1	A	236	THR	N-CA-C	6.14	119.57	110.48
1	B	255	ASN	N-CA-C	5.36	116.80	111.07
1	A	232	ASN	CB-CA-C	5.32	119.30	110.90
1	A	123	ILE	N-CA-CB	5.17	120.52	110.45

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	232	ASN	Mainchain
1	A	234	GLY	Peptide
1	A	235	ASP	Peptide
1	B	311	ILE	Peptide
1	B	312	ASP	Peptide

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	3383	0	3333	33	0
1	B	3387	0	3345	39	5
2	A	36	0	22	0	0
2	B	36	0	21	0	0
3	A	250	0	0	1	0
3	B	216	0	0	2	0
All	All	7308	0	6721	72	5

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 (72) 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:233:SER:OG	1:A:234:GLY:O	1.53	1.22
1:B:314:ASP:OD1	1:B:316:LYS:N	2.02	0.91
1:B:314:ASP:CG	1:B:316:LYS:H	1.86	0.82
1:A:232:ASN:O	1:A:234:GLY:N	2.12	0.82
1:A:289:LEU:HG	1:A:293:MET:HE2	1.64	0.79
1:A:232:ASN:HD21	1:A:243:VAL:H	1.28	0.78
1:B:253:GLU:OE2	1:B:254:HIS:N	2.16	0.78
1:B:313:LYS:NZ	1:B:313:LYS:HB3	2.00	0.76
1:A:157:THR:HG22	1:A:231:LEU:HD21	1.67	0.75
1:B:313:LYS:HB3	1:B:313:LYS:HZ3	1.53	0.71
1:B:186:ASN:ND2	1:B:384:ARG:HE	1.90	0.68
1:A:257:GLN:NE2	1:A:345:GLU:OE2	2.29	0.66
1:B:280:ARG:O	1:B:280:ARG:HG3	1.96	0.66
1:B:290:GLU:HA	1:B:293:MET:HE3	1.78	0.64
1:B:289:LEU:O	1:B:293:MET:HG3	2.00	0.61
1:A:232:ASN:C	1:A:234:GLY:H	2.09	0.60
1:A:175:GLU:HG2	1:A:181:PRO:HB3	1.84	0.58
1:B:281:THR:O	1:B:282:ALA:HB3	2.05	0.56
1:A:253:GLU:HA	1:A:253:GLU:OE1	2.06	0.55
1:B:153:ALA:O	1:B:157:THR:HG23	2.07	0.55
1:B:196:HIS:CD2	1:B:198:PHE:H	2.25	0.55
1:A:153:ALA:O	1:A:157:THR:HG23	2.07	0.54
1:A:233:SER:CB	1:A:234:GLY:O	2.54	0.54
1:B:311:ILE:O	1:B:311:ILE:HG23	2.07	0.54
1:A:196:HIS:CD2	1:A:198:PHE:H	2.26	0.53
1:A:269:GLU:HG2	1:A:270:LYS:HG3	1.91	0.53
1:B:290:GLU:HA	1:B:293:MET:CE	2.39	0.53
1:A:251:GLU:H	1:A:251:GLU:CD	2.18	0.52
1:B:248:PRO:HB3	1:B:365:MET:HE3	1.92	0.52
1:B:21:HIS:CD2	1:B:51:LYS:HD3	2.46	0.51
1:B:256:LYS:HG2	1:B:257:GLN:O	2.10	0.50
1:A:23:VAL:HG23	1:A:123:ILE:HG21	1.92	0.50
1:B:313:LYS:NZ	1:B:313:LYS:CB	2.73	0.50
1:A:178:GLY:HA3	1:A:236:THR:HG23	1.94	0.50
1:B:255:ASN:OD1	1:B:255:ASN:N	2.43	0.50
1:B:376:ALA:HB3	1:B:398:TRP:HA	1.94	0.50
1:B:433:GLU:OE2	1:B:436:ARG:NH2	2.35	0.50
1:B:196:HIS:HD2	1:B:198:PHE:H	1.58	0.50
1:A:235:ASP:N	1:A:235:ASP:OD1	2.42	0.49
1:A:190:PRO:HB3	1:A:196:HIS:CG	2.47	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:166:ALA:O	1:B:170:SER:N	2.45	0.49
1:A:21:HIS:HE1	1:A:53:THR:OG1	1.95	0.49
1:A:311:ILE:HD12	1:A:312:ASP:N	2.28	0.49
1:B:95:VAL:HG11	1:B:100:LEU:HD13	1.94	0.49
1:A:290:GLU:HA	1:A:293:MET:HE3	1.95	0.48
1:A:258:GLU:HB3	1:A:261:LEU:HG	1.94	0.48
1:B:186:ASN:HD22	1:B:384:ARG:HE	1.58	0.48
1:B:314:ASP:CG	1:B:315:ASP:N	2.72	0.47
1:B:51:LYS:NZ	3:B:1007:HOH:O	2.48	0.47
1:B:144:PRO:HB3	1:B:213:LYS:HE3	1.96	0.47
1:A:232:ASN:O	1:A:233:SER:C	2.56	0.46
1:A:196:HIS:HD2	1:A:198:PHE:H	1.64	0.46
1:B:190:PRO:HB3	1:B:196:HIS:CG	2.50	0.46
1:A:236:THR:HB	1:A:237:LEU:HD22	1.98	0.45
1:A:233:SER:C	1:A:234:GLY:O	2.37	0.45
1:B:171:SER:HA	3:B:1002:HOH:O	2.17	0.45
1:A:368:ALA:O	1:A:431:GLY:HA2	2.18	0.44
1:A:311:ILE:H	1:A:311:ILE:HG13	1.64	0.43
1:B:33:LEU:HD21	1:B:69:ILE:HG13	2.00	0.43
1:A:308:THR:HG21	3:A:1082:HOH:O	2.18	0.42
1:B:103:LYS:HE3	1:B:107:ASP:OD2	2.19	0.42
1:B:314:ASP:OD1	1:B:316:LYS:CA	2.67	0.42
1:A:310:LYS:HD3	1:A:310:LYS:HA	1.80	0.42
1:A:236:THR:HB	1:A:237:LEU:CD2	2.51	0.41
1:B:257:GLN:NE2	1:B:261:LEU:HD12	2.36	0.41
1:B:314:ASP:HB3	1:B:339:LYS:HE2	2.03	0.41
1:B:277:PHE:CZ	1:B:283:MET:HE1	2.56	0.41
1:B:19:GLN:HA	1:B:20:PRO:HD3	1.93	0.41
1:B:286:ASP:O	1:B:290:GLU:HG3	2.20	0.41
1:A:34:THR:N	1:A:35:PRO:HD2	2.36	0.40
1:A:51:LYS:HD3	1:A:121:PRO:HD2	2.03	0.40
1:B:312:ASP:HB3	1:B:313:LYS:O	2.20	0.40

All (5) 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:B:315:ASP:CG	1:B:315:ASP:OD1[2_555]	0.85	1.35
1:B:315:ASP:OD1	1:B:315:ASP:OD2[2_555]	1.13	1.07
1:B:315:ASP:OD1	1:B:315:ASP:OD1[2_555]	1.28	0.92

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:315:ASP:CG	1:B:315:ASP:CG[2_555]	1.68	0.52
1:B:315:ASP:CG	1:B:315:ASP:OD2[2_555]	2.14	0.06

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	432/457 (94%)	426 (99%)	6 (1%)	0	100	100
1	B	432/457 (94%)	428 (99%)	4 (1%)	0	100	100
All	All	864/914 (94%)	854 (99%)	10 (1%)	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	378/400 (94%)	376 (100%)	2 (0%)	81	87
1	B	379/400 (95%)	373 (98%)	6 (2%)	55	62
All	All	757/800 (95%)	749 (99%)	8 (1%)	65	73

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	235	ASP

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Mol	Chain	Res	Type
1	A	237	LEU
1	B	253	GLU
1	B	280	ARG
1	B	281	THR
1	B	309	SER
1	B	313	LYS
1	B	314	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	21	HIS
1	A	49	ASN
1	A	232	ASN
1	A	250	ASN
1	A	362	ASN
1	B	19	GLN
1	B	49	ASN
1	B	87	ASN
1	B	115	HIS
1	B	186	ASN
1	B	196	HIS
1	B	279	ASN
1	B	343	GLN
1	B	379	GLN
1	B	407	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry

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
2	UPG	B	901	-	37,38,38	2.54	18 (48%)	55,58,58	1.56	7 (12%)
2	UPG	A	900	-	37,38,38	2.51	13 (35%)	55,58,58	1.68	12 (21%)

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	UPG	B	901	-	-	2/23/59/59	0/3/3/3
2	UPG	A	900	-	-	2/23/59/59	0/3/3/3

All (31) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	900	UPG	C4-N3	-5.56	1.29	1.38
2	A	900	UPG	C2-N3	-5.43	1.28	1.38
2	B	901	UPG	C2-N3	-5.22	1.28	1.38
2	B	901	UPG	PB-O3A	-5.05	1.54	1.59
2	A	900	UPG	PB-O3A	-4.77	1.54	1.59
2	B	901	UPG	C4-N3	-4.68	1.30	1.38
2	A	900	UPG	PA-O3A	-4.40	1.54	1.59
2	A	900	UPG	PB-O2B	-4.37	1.35	1.55
2	B	901	UPG	PB-O2B	-4.35	1.35	1.55
2	B	901	UPG	PA-O2A	-4.15	1.36	1.55
2	B	901	UPG	PA-O3A	-4.00	1.55	1.59
2	A	900	UPG	C6-N1	-3.71	1.29	1.38
2	A	900	UPG	PA-O2A	-3.61	1.38	1.55
2	B	901	UPG	PA-O1A	-3.56	1.38	1.50
2	A	900	UPG	PB-O1B	-3.53	1.38	1.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	900	UPG	PA-O1A	-3.51	1.38	1.50
2	A	900	UPG	C5-C4	-3.37	1.36	1.43
2	B	901	UPG	PB-O1B	-3.15	1.39	1.50
2	B	901	UPG	C6-N1	-3.13	1.30	1.38
2	A	900	UPG	PB-O3B	-3.11	1.49	1.59
2	B	901	UPG	PB-O3B	-3.09	1.49	1.59
2	B	901	UPG	O4-C4	-2.81	1.19	1.24
2	B	901	UPG	O4C-C4C	-2.71	1.39	1.45
2	B	901	UPG	O3C-C3C	-2.51	1.36	1.43
2	B	901	UPG	O4C-C1C	-2.43	1.36	1.42
2	A	900	UPG	O2C-C2C	-2.33	1.37	1.43
2	B	901	UPG	PA-O5C	-2.29	1.50	1.59
2	B	901	UPG	C5-C4	-2.29	1.38	1.43
2	A	900	UPG	O4C-C4C	-2.16	1.40	1.45
2	B	901	UPG	O2C-C2C	-2.14	1.37	1.43
2	B	901	UPG	O5'-C5'	-2.09	1.39	1.44

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	900	UPG	N3-C2-N1	5.17	121.62	114.89
2	B	901	UPG	N3-C2-N1	5.13	121.56	114.89
2	B	901	UPG	C4-N3-C2	-4.55	120.96	126.61
2	B	901	UPG	C5-C4-N3	3.91	120.28	114.80
2	A	900	UPG	C6-N1-C2	-3.49	116.75	121.00
2	B	901	UPG	O4-C4-C5	-3.36	119.36	125.16
2	B	901	UPG	O3A-PB-O1B	-3.04	101.57	110.70
2	A	900	UPG	O4C-C1C-N1	2.82	114.75	108.36
2	A	900	UPG	O2-C2-N3	-2.70	116.50	121.49
2	A	900	UPG	C4-N3-C2	-2.68	123.29	126.61
2	A	900	UPG	O2A-PA-O3A	2.65	114.45	107.27
2	A	900	UPG	O5'-C1'-C2'	-2.63	104.97	110.37
2	A	900	UPG	C4C-O4C-C1C	2.61	115.22	109.47
2	A	900	UPG	O2B-PB-O3A	2.27	113.40	107.27
2	A	900	UPG	C1'-O5'-C5'	2.07	117.77	113.72
2	B	901	UPG	O2-C2-N3	-2.05	117.71	121.49
2	A	900	UPG	O3A-PA-O1A	-2.04	104.58	110.70
2	A	900	UPG	C5-C4-N3	2.03	117.64	114.80
2	B	901	UPG	C6-N1-C2	-2.01	118.55	121.00

There are no chirality outliers.

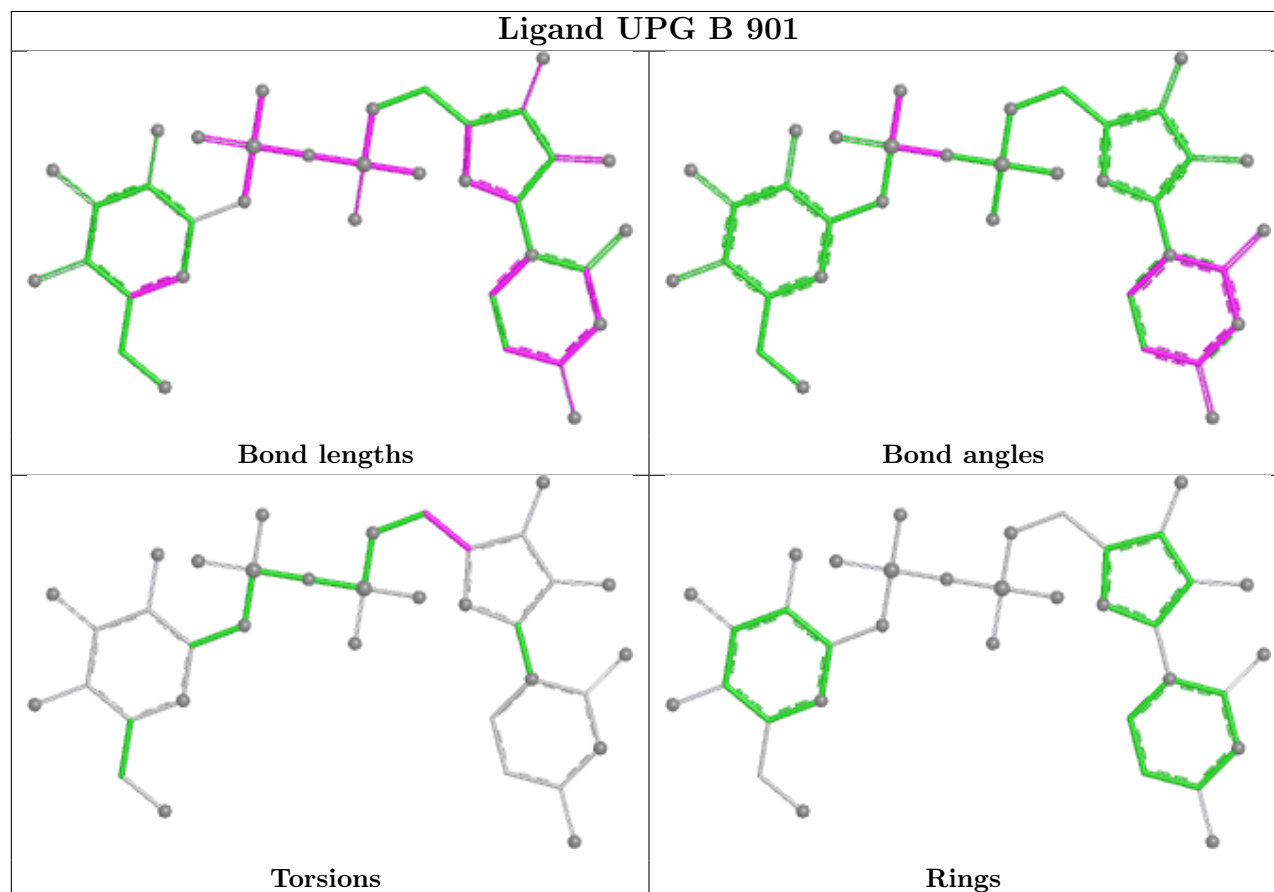
All (4) torsion outliers are listed below:

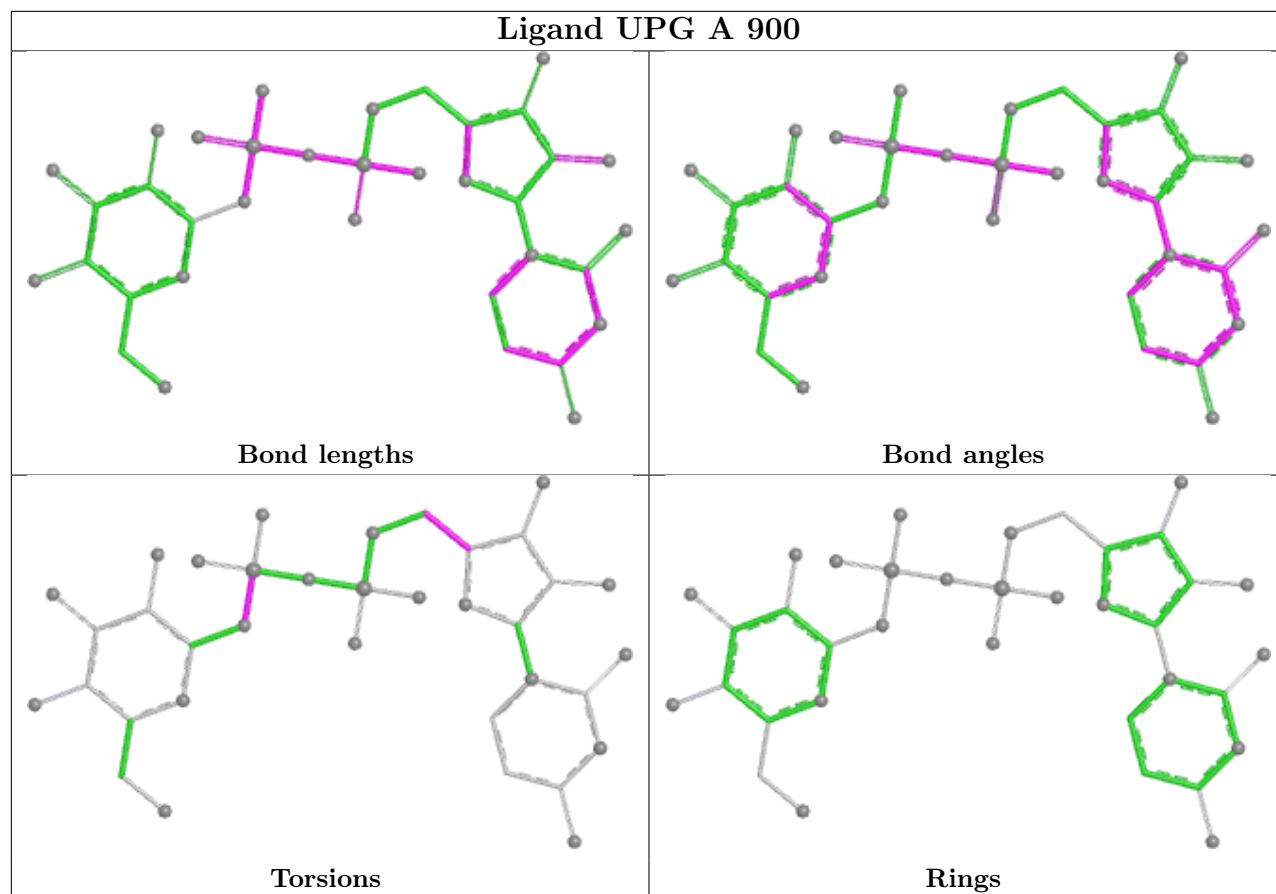
Mol	Chain	Res	Type	Atoms
2	A	900	UPG	C1'-O3B-PB-O1B
2	B	901	UPG	O4C-C4C-C5C-O5C
2	B	901	UPG	C3C-C4C-C5C-O5C
2	A	900	UPG	O4C-C4C-C5C-O5C

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

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	436/457 (95%)	0.43	43 (9%) 13 11	20, 30, 64, 103	0
1	B	436/457 (95%)	0.60	59 (13%) 7 6	18, 31, 64, 91	0
All	All	872/914 (95%)	0.51	102 (11%) 9 8	18, 31, 64, 103	0

All (102) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	315	ASP	14.2
1	B	311	ILE	8.6
1	A	235	ASP	8.3
1	A	236	THR	8.1
1	B	281	THR	7.9
1	A	234	GLY	7.0
1	B	254	HIS	6.9
1	B	312	ASP	6.8
1	A	166	ALA	6.6
1	B	255	ASN	6.6
1	B	313	LYS	6.3
1	B	314	ASP	6.2
1	B	166	ALA	6.1
1	B	309	SER	5.7
1	A	233	SER	5.4
1	B	308	THR	5.2
1	A	170	SER	5.1
1	B	171	SER	4.8
1	A	232	ASN	4.7
1	A	311	ILE	4.6
1	A	251	GLU	4.5
1	B	113	PRO	4.5
1	B	310	LYS	4.5
1	B	61	ILE	4.3

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Mol	Chain	Res	Type	RSRZ
1	A	237	LEU	4.1
1	A	254	HIS	4.1
1	B	283	MET	4.0
1	B	170	SER	3.9
1	B	251	GLU	3.8
1	A	252	LEU	3.8
1	A	308	THR	3.7
1	B	280	ARG	3.7
1	B	252	LEU	3.7
1	B	141	PRO	3.6
1	B	67	HIS	3.5
1	B	257	GLN	3.5
1	B	70	SER	3.5
1	B	114	VAL	3.5
1	A	318	GLU	3.5
1	B	239	ASP	3.4
1	B	419	GLY	3.4
1	B	316	LYS	3.3
1	A	421	ASN	3.3
1	B	33	LEU	3.3
1	B	172	SER	3.2
1	A	256	LYS	3.2
1	B	139	THR	3.2
1	B	74	SER	3.1
1	B	140	LEU	3.1
1	A	117	SER	3.1
1	A	239	ASP	3.0
1	B	238	SER	3.0
1	A	61	ILE	3.0
1	A	255	ASN	2.9
1	B	165	LEU	2.9
1	A	310	LYS	2.9
1	B	18	ASP	2.9
1	A	238	SER	2.9
1	A	67	HIS	2.9
1	A	253	GLU	2.8
1	A	27	GLY	2.7
1	A	64	ALA	2.7
1	B	118	ALA	2.7
1	B	68	HIS	2.7
1	A	312	ASP	2.7
1	A	68	HIS	2.7

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Mol	Chain	Res	Type	RSRZ
1	B	279	ASN	2.7
1	A	123	ILE	2.7
1	A	419	GLY	2.6
1	B	173	PRO	2.6
1	A	404	SER	2.6
1	B	322	LEU	2.6
1	A	250	ASN	2.5
1	B	318	GLU	2.5
1	A	282	ALA	2.4
1	B	46	ALA	2.4
1	B	282	ALA	2.4
1	A	165	LEU	2.4
1	B	307	LYS	2.4
1	B	117	SER	2.4
1	A	401	GLU	2.4
1	B	278	GLY	2.4
1	B	237	LEU	2.3
1	B	51	LYS	2.3
1	B	66	SER	2.3
1	B	297	ARG	2.3
1	B	164	HIS	2.3
1	A	172	SER	2.2
1	A	309	SER	2.2
1	B	236	THR	2.2
1	A	403	ALA	2.2
1	A	428	MET	2.2
1	A	179	LEU	2.2
1	A	231	LEU	2.2
1	A	279	ASN	2.2
1	B	440	VAL	2.1
1	A	314	ASP	2.1
1	B	253	GLU	2.1
1	B	63	ASP	2.1
1	B	45	SER	2.1
1	B	120	SER	2.1
1	B	142	HIS	2.1

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 [i](#)

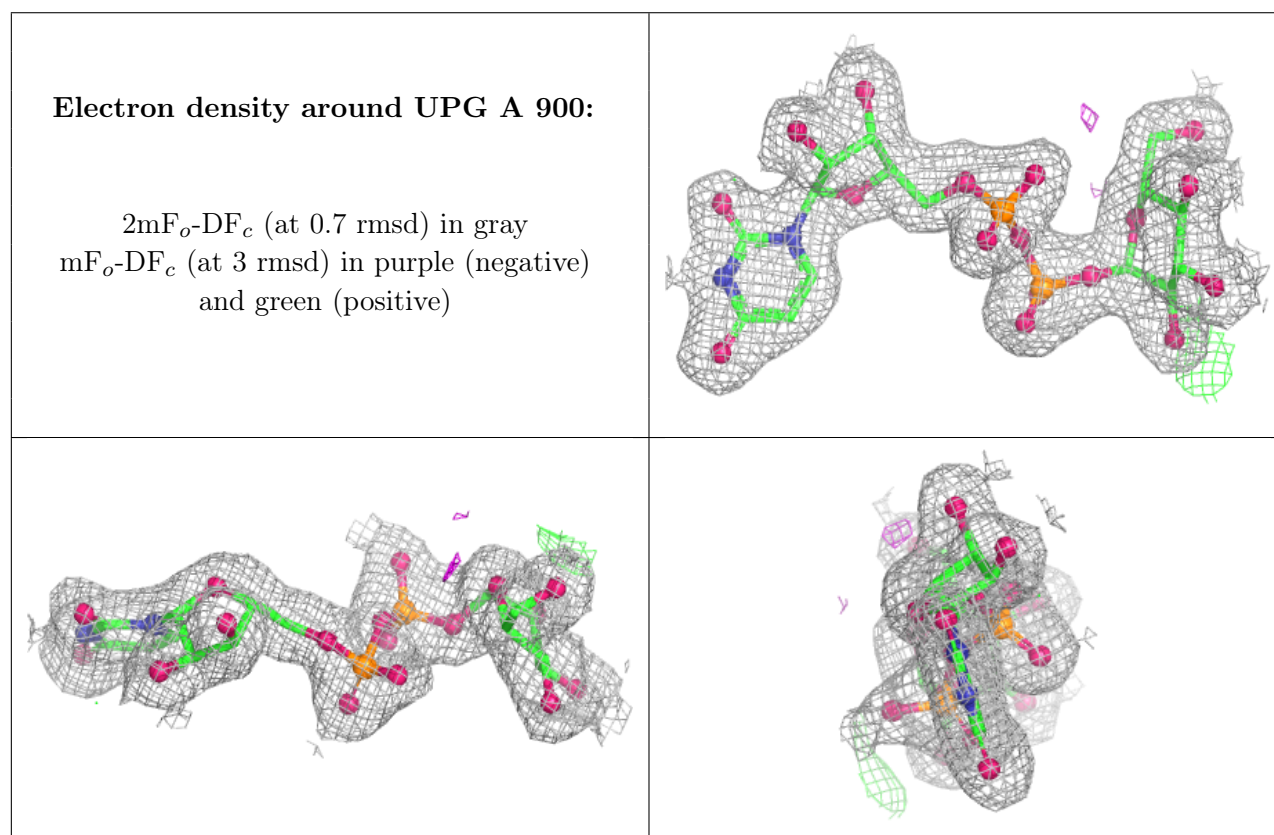
There are no oligosaccharides in this entry.

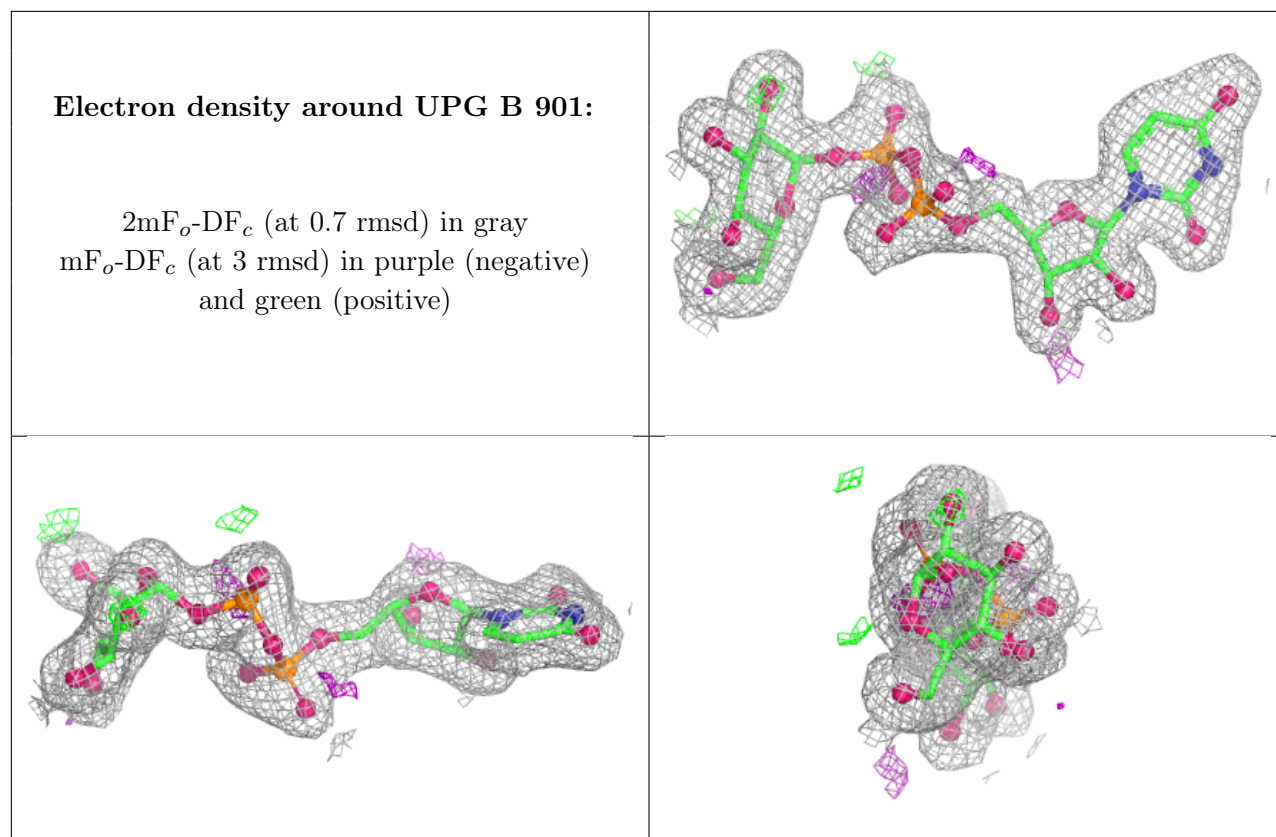
6.4 Ligands [i](#)

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($\text{\AA}^2$)	Q<0.9
2	UPG	A	900	36/36	0.96	0.08	22,32,44,56	0
2	UPG	B	901	36/36	0.96	0.09	22,32,45,52	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.