Full wwPDB X-ray Structure Validation Report ⓘ

Apr 8, 2024 – 12:31 PM JST

PDB ID	:	8J2T
Title	:	Glucosyl Transferase NbUGT72AY1 co-crystallized with UDP-2F glucose and Scopoletin
Authors	:	Arold, S.T.; Hameed, U.F.S.
Deposited on	:	2023-04-15
Resolution	:	3.15 Å(reported)

The following versions of software and data (see references ⓘ) were used in the production of this report:

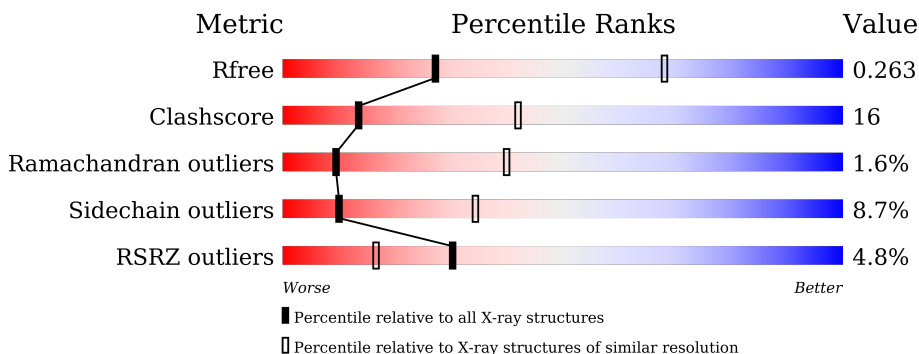|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

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 3.15 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	Percentile Ranks	Value
Rfree		0.263
Clashscore		16
Ramachandran outliers		1.6%
Sidechain outliers		8.7%
RSRZ outliers		4.8%

Worse   *Better*

▌Percentile relative to all X-ray structures

▯Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	130704	1665 (3.20-3.12)
Clashscore	141614	1804 (3.20-3.12)
Ramachandran outliers	138981	1770 (3.20-3.12)
Sidechain outliers	138945	1769 (3.20-3.12)
RSRZ outliers	127900	1616 (3.20-3.12)

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	482	2% 67% 28% · ··
1	B	482	8% 62% 32% · ··

2 Entry composition ⓘ

There are 3 unique types of molecules in this entry. The entry contains 7616 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 Glycosyltransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	477	Total	C	N	O	S	0	0	0
			3758	2393	631	717	17			
1	B	477	Total	C	N	O	S	0	0	0
			3758	2393	631	717	17			

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-4	GLY	-	expression tag	UNP A0A8K1ZRH3
A	-3	PRO	-	expression tag	UNP A0A8K1ZRH3
A	-2	LEU	-	expression tag	UNP A0A8K1ZRH3
A	-1	GLY	-	expression tag	UNP A0A8K1ZRH3
A	0	SER	-	expression tag	UNP A0A8K1ZRH3
B	-4	GLY	-	expression tag	UNP A0A8K1ZRH3
B	-3	PRO	-	expression tag	UNP A0A8K1ZRH3
B	-2	LEU	-	expression tag	UNP A0A8K1ZRH3
B	-1	GLY	-	expression tag	UNP A0A8K1ZRH3
B	0	SER	-	expression tag	UNP A0A8K1ZRH3

- Molecule 2 is 7-hydroxy-6-methoxy-2H-1-benzopyran-2-one (three-letter code: T83) (formula: $C_{10}H_8O_4$) (labeled as "Ligand of Interest" by depositor).

T83
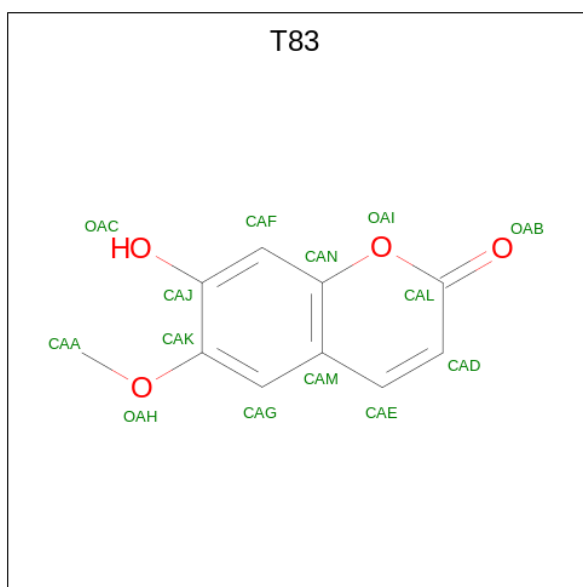
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total 14	C 10	O 4	0	0
2	B	1	Total 14	C 10	O 4	0	0

- Molecule 3 is URIDINE-5'-DIPHOSPHATE-GLUCOSE (three-letter code: UPG) (formula: $C_{15}H_{24}N_2O_{17}P_2$) (labeled as "Ligand of Interest" by depositor).

UPG

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

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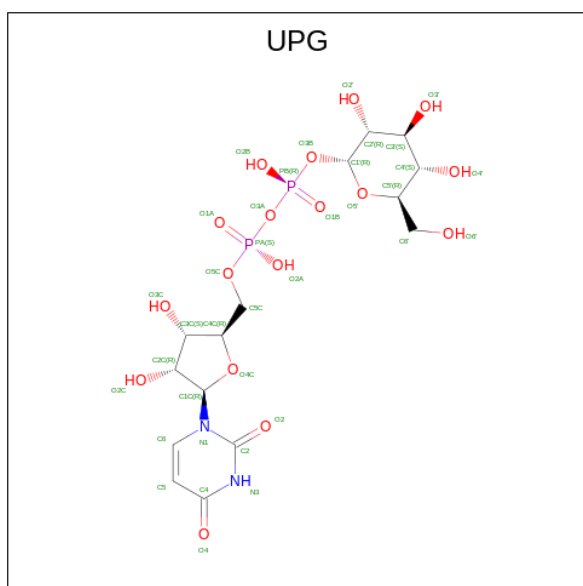
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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
3	B	1	36	15	2	17	2	0	0

3 Residue-property plots ⓘ

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: Glycosyltransferase

Chain A:

- Molecule 1: Glycosyltransferase

Chain B:
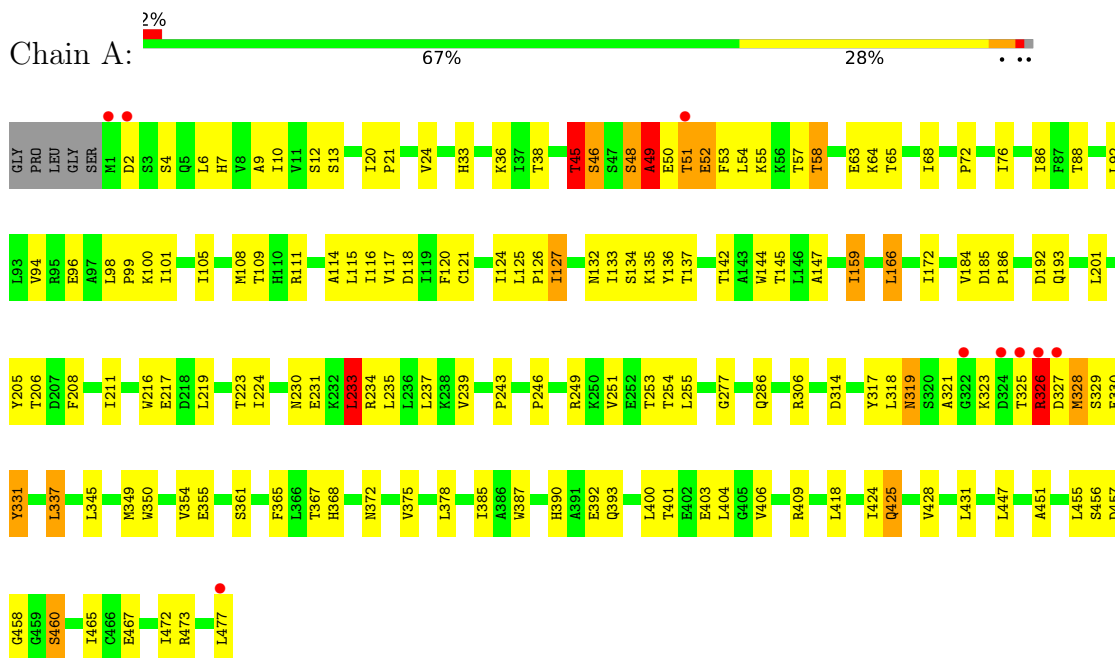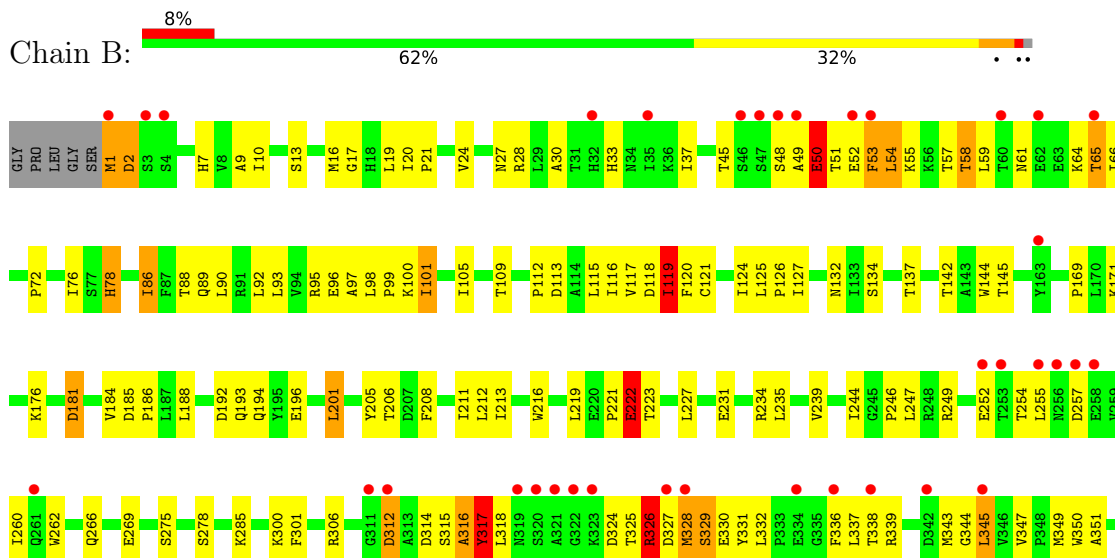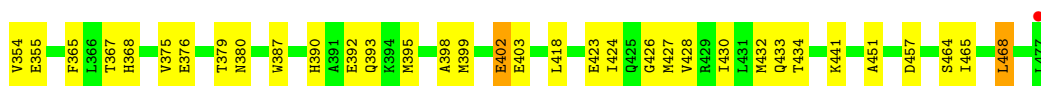
4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	I 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	101.61Å 114.92Å 104.25Å 90.00° 103.12° 90.00°	Depositor
Resolution (Å)	46.83 – 3.15 46.79 – 3.15	Depositor EDS
% Data completeness (in resolution range)	98.2 (46.83-3.15) 98.3 (46.79-3.15)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	0.98 (at 3.12Å)	Xtriage
Refinement program	REFMAC 5	Depositor
R, R_{free}	0.197 , 0.261 0.204 , 0.263	Depositor DCC
R_{free} test set	901 reflections (4.53%)	wwPDB-VP
Wilson B-factor (Å^2)	71.3	Xtriage
Anisotropy	0.150	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 61.6	EDS
L-test for twinning[2]	$< |L| > = 0.47, < L^2 > = 0.30$	Xtriage
Estimated twinning fraction	0.027 for l,-k,h	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	7616	wwPDB-VP
Average B, all atoms (Å^2)	79.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.18% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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: UPG, T83

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	0.45	0/3831	0.71	2/5197 (0.0%)
1	B	0.44	0/3831	0.71	0/5197
All	All	0.45	0/7662	0.71	2/10394 (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	2
1	B	0	1
All	All	0	3

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	118	ASP	CB-CG-OD2	-5.69	113.18	118.30
1	A	233	LEU	N-CA-C	-5.03	97.42	111.00

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	45	THR	Peptide
1	A	49	ALA	Peptide
1	B	316	ALA	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	3758	0	3834	102	0
1	B	3758	0	3834	142	0
2	A	14	0	0	0	0
2	B	14	0	0	0	0
3	A	36	0	22	1	0
3	B	36	0	22	4	0
All	All	7616	0	7712	245	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 16.

All (245) 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:B:90:LEU:HA	1:B:93:LEU:HD12	1.38	1.05
1:B:328:MET:HA	1:B:331:TYR:CZ	2.04	0.93
1:A:51:THR:HA	1:A:54:LEU:HD12	1.52	0.91
1:B:376:GLU:O	1:B:380:ASN:ND2	2.07	0.87
1:B:50:GLU:HG3	1:B:51:THR:H	1.45	0.82
1:B:50:GLU:HA	1:B:53:PHE:CD2	2.15	0.82
1:A:52:GLU:HA	1:A:55:LYS:HG2	1.63	0.80
1:B:142:THR:HG21	1:B:399:MET:HE3	1.62	0.80
1:B:50:GLU:HA	1:B:53:PHE:CG	2.16	0.80
1:B:51:THR:HA	1:B:54:LEU:HD23	1.64	0.79
1:B:98:LEU:HA	1:B:101:ILE:HD11	1.64	0.79
1:B:50:GLU:HG3	1:B:51:THR:N	1.97	0.78
1:B:398:ALA:O	1:B:402:GLU:HG2	1.84	0.78
1:B:58:THR:HB	1:B:59:LEU:HD22	1.65	0.77
1:B:184:VAL:HG13	1:B:395:MET:HE1	1.66	0.76
1:B:328:MET:HA	1:B:331:TYR:CE1	2.21	0.75
1:B:257:ASP:OD2	1:B:260:ILE:HD13	1.87	0.73
1:B:50:GLU:HA	1:B:53:PHE:CE2	2.23	0.72
1:B:184:VAL:HG13	1:B:395:MET:CE	2.19	0.72
1:A:98:LEU:HD21	1:A:127:ILE:HD11	1.70	0.72
1:A:48:SER:OG	1:A:49:ALA:N	2.21	0.71

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:337:LEU:HD12	1:A:337:LEU:H	1.53	0.71
1:A:327:ASP:OD1	1:A:329:SER:OG	2.07	0.71
1:A:328:MET:SD	1:A:328:MET:N	2.64	0.70
1:A:21:PRO:HG3	1:A:372:ASN:HD21	1.57	0.70
1:B:1:MET:HG2	1:B:2:ASP:O	1.93	0.68
1:A:136:TYR:HE2	1:A:472:ILE:CD1	2.06	0.67
1:B:312:ASP:OD2	1:B:315:SER:HA	1.95	0.67
1:A:159:ILE:C	1:A:159:ILE:HD13	2.16	0.66
1:A:136:TYR:CE2	1:A:472:ILE:HD11	2.31	0.66
1:B:51:THR:O	1:B:54:LEU:HG	1.96	0.66
1:B:86:ILE:HD11	1:B:316:ALA:HA	1.77	0.66
1:B:50:GLU:HA	1:B:53:PHE:CD1	2.30	0.65
1:A:4:SER:O	1:A:473:ARG:NH2	2.27	0.65
1:B:49:ALA:O	1:B:53:PHE:CD2	2.49	0.65
1:B:142:THR:HG21	1:B:399:MET:CE	2.26	0.65
1:B:1:MET:SD	1:B:2:ASP:N	2.69	0.65
1:A:125:LEU:CD1	1:A:135:LYS:HD2	2.27	0.65
1:B:231:GLU:O	1:B:235:LEU:HD13	1.96	0.65
1:A:20:ILE:O	1:A:24:VAL:HG23	1.98	0.64
1:B:262:TRP:CD2	1:B:345:LEU:HD13	2.32	0.64
1:A:125:LEU:HD12	1:A:135:LYS:HD2	1.80	0.63
1:A:401:THR:HG21	1:A:409:ARG:HD3	1.80	0.63
1:A:286:GLN:OE1	1:A:418:LEU:HD12	1.98	0.63
1:B:249:ARG:NH2	1:B:354:VAL:HG23	2.14	0.63
1:A:21:PRO:CG	1:A:372:ASN:HD21	2.12	0.63
1:A:52:GLU:HA	1:A:55:LYS:CG	2.28	0.63
1:A:231:GLU:O	1:A:235:LEU:HD13	1.99	0.63
1:A:63:GLU:OE1	1:A:65:THR:HB	1.99	0.62
1:B:98:LEU:HA	1:B:101:ILE:CD1	2.28	0.62
1:A:21:PRO:HG3	1:A:372:ASN:ND2	2.14	0.62
1:B:20:ILE:O	1:B:24:VAL:HG23	1.99	0.62
1:B:50:GLU:HA	1:B:53:PHE:CZ	2.35	0.62
1:A:249:ARG:NH2	1:A:354:VAL:HG23	2.15	0.61
1:A:136:TYR:CE2	1:A:472:ILE:CD1	2.83	0.61
1:A:38:THR:HG21	1:A:108:MET:CE	2.29	0.61
1:A:390:HIS:CE1	1:A:393:GLN:HE22	2.19	0.61
1:A:63:GLU:OE1	1:A:65:THR:CB	2.48	0.61
1:B:176:LYS:NZ	1:B:402:GLU:HG3	2.16	0.60
1:A:114:ALA:HB2	1:A:472:ILE:HD12	1.81	0.60
1:A:456:SER:O	1:A:458:GLY:O	2.20	0.59
1:B:13:SER:OG	1:B:120:PHE:HB2	2.03	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:37:ILE:HB	1:B:66:ILE:HD13	1.85	0.59
1:A:159:ILE:HG13	1:A:166:LEU:HD11	1.84	0.59
1:B:390:HIS:CE1	1:B:393:GLN:HE22	2.21	0.59
1:A:13:SER:OG	1:A:120:PHE:HB2	2.03	0.59
1:B:121:CYS:HB3	1:B:124:ILE:HD12	1.85	0.59
1:B:16:MET:SD	1:B:53:PHE:CE2	2.96	0.58
1:A:328:MET:HA	1:A:331:TYR:CZ	2.38	0.58
1:B:50:GLU:HA	1:B:53:PHE:CE1	2.38	0.58
1:B:468:LEU:HD12	1:B:468:LEU:O	2.04	0.58
1:A:48:SER:O	1:A:50:GLU:HB3	2.04	0.57
1:B:325:THR:C	1:B:326:ARG:HG3	2.23	0.57
1:B:19:LEU:HD13	1:B:19:LEU:C	2.25	0.57
1:A:137:THR:HG21	1:A:205:TYR:HD1	1.70	0.56
1:B:398:ALA:O	1:B:402:GLU:CG	2.54	0.56
1:B:317:TYR:OH	3:B:502:UPG:H1'	2.04	0.56
1:A:86:ILE:CD1	1:A:318:LEU:HD12	2.36	0.56
1:B:212:LEU:HD12	1:B:212:LEU:N	2.21	0.55
1:B:355:GLU:N	1:B:355:GLU:OE1	2.39	0.55
1:A:318:LEU:O	1:A:319:ASN:HB2	2.07	0.55
1:B:337:LEU:HD12	1:B:337:LEU:H	1.70	0.55
1:B:423:GLU:O	1:B:427:MET:HG3	2.07	0.55
1:A:277:GLY:O	1:A:306:ARG:NH2	2.37	0.55
1:B:88:THR:HG23	1:B:194:GLN:HB3	1.89	0.55
1:B:88:THR:O	1:B:92:LEU:HG	2.06	0.54
1:B:37:ILE:HB	1:B:66:ILE:CD1	2.37	0.54
1:A:7:HIS:CD2	1:A:36:LYS:HE3	2.43	0.54
1:B:221:PRO:HD2	1:B:222:GLU:HG3	1.89	0.54
1:B:33:HIS:CD2	1:B:465:ILE:HG21	2.42	0.54
1:B:117:VAL:HG23	1:B:118:ASP:O	2.08	0.54
1:B:212:LEU:HD23	1:B:244:ILE:HD13	1.87	0.53
1:B:216:TRP:CZ3	1:B:219:LEU:HD22	2.44	0.53
1:B:201:LEU:HD12	1:B:201:LEU:O	2.09	0.53
1:B:330:GLU:HG3	1:B:331:TYR:N	2.23	0.53
1:A:86:ILE:HD13	1:A:318:LEU:HD12	1.90	0.53
1:A:392:GLU:OE1	3:A:502:UPG:O3'	2.26	0.53
1:B:329:SER:O	1:B:330:GLU:HG2	2.08	0.52
1:A:216:TRP:CZ3	1:A:219:LEU:HD22	2.44	0.52
1:B:54:LEU:HD11	1:B:55:LYS:HE3	1.91	0.52
1:B:208:PHE:O	1:B:239:VAL:HG11	2.08	0.52
1:B:125:LEU:HB2	1:B:126:PRO:HD3	1.91	0.52
1:A:208:PHE:O	1:A:239:VAL:HG11	2.09	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:30:ALA:HB2	1:B:66:ILE:HD11	1.91	0.52
1:A:137:THR:HG21	1:A:205:TYR:CD1	2.45	0.51
1:B:142:THR:OG1	1:B:145:THR:HG23	2.11	0.51
1:A:48:SER:O	1:A:49:ALA:C	2.49	0.51
1:B:137:THR:HG21	1:B:205:TYR:HD1	1.76	0.51
1:B:61:ASN:ND2	1:B:66:ILE:HB	2.25	0.51
1:A:50:GLU:O	1:A:53:PHE:N	2.44	0.51
1:A:125:LEU:HB3	1:A:126:PRO:HD3	1.92	0.51
1:B:119:ILE:HG12	1:B:205:TYR:OH	2.10	0.50
1:B:98:LEU:HD23	1:B:101:ILE:HD11	1.92	0.50
1:B:278:SER:OG	3:B:502:UPG:O1B	2.28	0.50
1:B:399:MET:O	1:B:403:GLU:O	2.29	0.50
1:B:61:ASN:HD22	1:B:66:ILE:HB	1.76	0.50
1:A:124:ILE:HG22	1:A:124:ILE:O	2.11	0.50
1:A:368:HIS:HA	1:A:387:TRP:O	2.11	0.50
1:B:98:LEU:O	1:B:101:ILE:HG12	2.12	0.50
1:B:368:HIS:HA	1:B:387:TRP:O	2.12	0.50
1:A:254:THR:O	1:A:254:THR:HG23	2.11	0.49
1:B:301:PHE:CE1	1:B:344:GLY:HA3	2.47	0.49
1:B:169:PRO:HG2	1:B:171:LYS:HE3	1.95	0.49
1:A:403:GLU:OE1	1:A:403:GLU:HA	2.12	0.49
1:A:48:SER:N	1:A:321:ALA:HB2	2.28	0.49
1:A:365:PHE:CZ	1:A:367:THR:HB	2.48	0.48
1:A:6:LEU:HD23	1:A:472:ILE:HG21	1.95	0.48
1:A:385:ILE:HG13	1:A:431:LEU:HD22	1.94	0.48
1:B:64:LYS:O	1:B:65:THR:C	2.52	0.48
1:B:249:ARG:CZ	1:B:354:VAL:HG23	2.42	0.48
1:A:136:TYR:HE2	1:A:472:ILE:HD11	1.71	0.48
1:B:328:MET:CA	1:B:331:TYR:CE1	2.96	0.48
1:B:316:ALA:O	1:B:318:LEU:O	2.31	0.48
1:A:76:ILE:HG22	1:A:96:GLU:HG3	1.94	0.48
1:B:312:ASP:O	1:B:315:SER:HB3	2.13	0.48
1:B:98:LEU:N	1:B:99:PRO:HD2	2.29	0.48
1:B:426:GLY:O	1:B:430:ILE:HG13	2.13	0.48
1:A:117:VAL:HB	1:A:121:CYS:HB2	1.95	0.48
1:A:249:ARG:CZ	1:A:354:VAL:HG23	2.44	0.48
1:A:10:ILE:HA	1:A:116:ILE:O	2.14	0.48
1:A:52:GLU:CA	1:A:55:LYS:HG2	2.40	0.48
1:B:181:ASP:N	1:B:181:ASP:OD1	2.47	0.48
1:B:78:HIS:ND1	1:B:78:HIS:N	2.61	0.48
1:B:244:ILE:HD12	1:B:247:LEU:HD11	1.96	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:365:PHE:CZ	1:B:367:THR:HB	2.49	0.48
1:B:10:ILE:HA	1:B:116:ILE:O	2.14	0.47
1:B:72:PRO:HG2	1:B:100:LYS:HE3	1.96	0.47
1:B:137:THR:HG21	1:B:205:TYR:CD1	2.49	0.47
1:A:9:ALA:HB3	1:A:115:LEU:HD12	1.96	0.47
1:B:324:ASP:O	1:B:326:ARG:HG3	2.14	0.47
1:A:306:ARG:HG2	1:A:349:MET:HA	1.96	0.47
1:A:246:PRO:HG3	1:A:451:ALA:HB1	1.96	0.47
1:B:9:ALA:HB3	1:B:115:LEU:HD12	1.97	0.47
1:A:314:ASP:HB3	1:A:390:HIS:CG	2.49	0.47
1:B:50:GLU:CG	1:B:51:THR:N	2.73	0.47
1:B:269:GLU:OE1	1:B:441:LYS:NZ	2.43	0.46
1:B:328:MET:HA	1:B:331:TYR:OH	2.15	0.46
1:B:176:LYS:HE3	1:B:403:GLU:OE1	2.15	0.46
1:B:262:TRP:CD2	1:B:345:LEU:CD1	2.98	0.46
1:A:230:ASN:O	1:A:234:ARG:HB2	2.16	0.46
1:A:33:HIS:CE1	1:A:465:ILE:HG21	2.50	0.46
1:B:97:ALA:O	1:B:101:ILE:HD13	2.16	0.46
1:B:306:ARG:HG2	1:B:349:MET:HA	1.97	0.46
1:B:124:ILE:O	1:B:124:ILE:HG22	2.16	0.45
1:B:45:THR:CG2	1:B:45:THR:O	2.64	0.45
1:B:76:ILE:HG22	1:B:96:GLU:HG3	1.97	0.45
1:A:72:PRO:HD2	1:A:100:LYS:HE2	1.98	0.45
1:A:328:MET:H	1:A:328:MET:CE	2.30	0.45
1:A:57:THR:O	1:A:58:THR:C	2.55	0.45
1:B:185:ASP:HA	1:B:188:LEU:HD12	1.99	0.45
1:B:327:ASP:O	1:B:329:SER:O	2.34	0.45
1:A:88:THR:O	1:A:92:LEU:HD13	2.16	0.45
1:A:326:ARG:HD3	1:A:331:TYR:CD2	2.51	0.45
1:B:45:THR:O	1:B:45:THR:HG22	2.16	0.45
1:A:217:GLU:HG3	1:A:460:SER:HB2	1.99	0.45
1:B:57:THR:O	1:B:57:THR:HG22	2.17	0.45
1:B:337:LEU:HD12	1:B:337:LEU:N	2.32	0.45
1:A:144:TRP:HA	1:A:223:THR:HG21	1.99	0.44
1:B:30:ALA:CB	1:B:66:ILE:HD11	2.47	0.44
1:B:89:GLN:O	1:B:93:LEU:HG	2.17	0.44
1:A:54:LEU:HD22	1:A:68:ILE:HG21	1.99	0.44
1:B:246:PRO:HG3	1:B:451:ALA:HB1	1.99	0.44
1:B:252:GLU:O	1:B:254:THR:HG23	2.17	0.44
1:B:338:THR:OG1	1:B:339:ARG:N	2.50	0.44
1:B:17:GLY:O	3:B:502:UPG:H6'2	2.17	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:327:ASP:OD1	1:B:328:MET:N	2.50	0.44
1:A:246:PRO:HB2	1:A:375:VAL:HG13	2.00	0.43
1:B:49:ALA:HA	1:B:52:GLU:HB2	2.00	0.43
1:B:137:THR:HG23	1:B:211:ILE:HG23	2.00	0.43
1:B:184:VAL:HG12	1:B:392:GLU:HA	2.00	0.43
1:A:45:THR:OG1	1:A:46:SER:N	2.51	0.43
1:A:7:HIS:CD2	1:A:36:LYS:CE	3.01	0.43
1:B:185:ASP:HA	1:B:188:LEU:CD1	2.48	0.43
1:A:105:ILE:O	1:A:108:MET:HB2	2.18	0.43
1:A:378:LEU:HD21	1:A:406:VAL:HG21	2.01	0.43
1:A:425:GLN:HE21	1:A:425:GLN:HB3	1.68	0.43
1:A:424:ILE:O	1:A:428:VAL:HG23	2.18	0.43
1:B:430:ILE:HA	1:B:434:THR:CG2	2.49	0.43
1:A:142:THR:OG1	1:A:145:THR:HG23	2.17	0.43
1:A:251:VAL:HG13	1:A:355:GLU:HG3	2.01	0.43
1:A:314:ASP:O	1:A:317:TYR:HB2	2.19	0.43
1:A:63:GLU:OE1	1:A:65:THR:OG1	2.35	0.43
1:A:98:LEU:HB3	1:A:99:PRO:HD3	2.01	0.43
1:A:318:LEU:O	1:A:319:ASN:CB	2.66	0.43
1:A:400:LEU:HD23	1:A:404:LEU:HD12	2.01	0.43
1:B:33:HIS:NE2	1:B:465:ILE:HG21	2.33	0.43
1:A:192:ASP:OD1	1:A:193:GLN:N	2.52	0.42
1:A:326:ARG:HD3	1:A:331:TYR:HD2	1.83	0.42
1:A:365:PHE:CE1	1:A:367:THR:HB	2.54	0.42
1:A:326:ARG:HA	1:A:330:GLU:OE2	2.20	0.42
1:B:50:GLU:N	1:B:53:PHE:H	2.18	0.42
1:B:266:GLN:OE1	1:B:300:LYS:HD2	2.18	0.42
1:B:246:PRO:HB2	1:B:375:VAL:HG13	2.01	0.42
1:A:185:ASP:HB2	1:A:186:PRO:HD3	2.01	0.42
1:B:7:HIS:ND1	1:B:112:PRO:HA	2.35	0.42
1:B:92:LEU:HD22	1:B:95:ARG:NH2	2.34	0.42
1:A:133:ILE:HG22	1:A:134:SER:O	2.20	0.42
1:A:246:PRO:CG	1:A:451:ALA:HB1	2.50	0.42
1:B:192:ASP:OD1	1:B:193:GLN:N	2.52	0.42
1:B:424:ILE:O	1:B:428:VAL:HG23	2.19	0.42
1:B:176:LYS:HZ2	1:B:402:GLU:HG3	1.83	0.41
1:B:176:LYS:HZ1	1:B:402:GLU:HG3	1.84	0.41
1:B:201:LEU:HD12	1:B:201:LEU:C	2.40	0.41
1:A:137:THR:HG23	1:A:211:ILE:HG23	2.02	0.41
1:A:184:VAL:HG12	1:A:392:GLU:HA	2.03	0.41
1:A:224:ILE:HD13	1:A:243:PRO:HG2	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:144:TRP:CZ3	1:B:395:MET:HG2	2.56	0.41
3:B:502:UPG:H5'	3:B:502:UPG:O1A	2.21	0.41
1:B:86:ILE:O	1:B:90:LEU:HD13	2.20	0.41
1:B:118:ASP:OD1	1:B:119:ILE:N	2.52	0.41
1:B:144:TRP:HA	1:B:223:THR:HG21	2.03	0.41
1:A:94:VAL:HG11	1:A:121:CYS:HA	2.02	0.41
1:B:227:LEU:O	1:B:234:ARG:HD3	2.21	0.41
1:B:332:LEU:HD23	1:B:336:PHE:CD2	2.56	0.41
1:A:231:GLU:C	1:A:233:LEU:O	2.60	0.41
1:B:119:ILE:HG22	1:B:120:PHE:CD2	2.55	0.41
1:B:347:VAL:HG11	1:B:351:ALA:HB2	2.01	0.41
1:B:185:ASP:HB2	1:B:186:PRO:HD3	2.02	0.41
1:B:20:ILE:N	1:B:21:PRO:HD2	2.36	0.40
1:B:365:PHE:CE1	1:B:367:THR:HB	2.56	0.40
1:A:147:ALA:HB1	1:A:172:ILE:HG21	2.04	0.40
1:B:300:LYS:HA	1:B:343:MET:O	2.21	0.40
1:A:246:PRO:O	1:A:455:LEU:HD11	2.22	0.40
1:B:212:LEU:HD21	1:B:468:LEU:HD21	2.04	0.40
1:B:375:VAL:O	1:B:379:THR:HG23	2.22	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	475/482 (98%)	432 (91%)	36 (8%)	7 (2%)	10	41
1	B	475/482 (98%)	432 (91%)	35 (7%)	8 (2%)	9	38
All	All	950/964 (98%)	864 (91%)	71 (8%)	15 (2%)	9	40

All (15) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	319	ASN
1	B	65	THR
1	B	317	TYR
1	B	326	ARG
1	A	49	ALA
1	A	253	THR
1	A	326	ARG
1	B	50	GLU
1	A	45	THR
1	A	64	LYS
1	B	2	ASP
1	A	2	ASP
1	B	222	GLU
1	B	328	MET
1	B	119	ILE

5.3.2 Protein sidechains ⓘ

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	425/428 (99%)	392 (92%)	33 (8%)	12	40
1	B	425/428 (99%)	384 (90%)	41 (10%)	8	29
All	All	850/856 (99%)	776 (91%)	74 (9%)	10	34

All (74) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	12	SER
1	A	46	SER
1	A	48	SER
1	A	51	THR
1	A	52	GLU
1	A	58	THR
1	A	101	ILE
1	A	109	THR
1	A	111	ARG

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Mol	Chain	Res	Type
1	A	127	ILE
1	A	132	ASN
1	A	159	ILE
1	A	166	LEU
1	A	201	LEU
1	A	206	THR
1	A	233	LEU
1	A	237	LEU
1	A	255	LEU
1	A	323	LYS
1	A	325	THR
1	A	326	ARG
1	A	328	MET
1	A	331	TYR
1	A	337	LEU
1	A	345	LEU
1	A	350	TRP
1	A	361	SER
1	A	425	GLN
1	A	447	LEU
1	A	457	ASP
1	A	460	SER
1	A	467	GLU
1	A	477	LEU
1	B	1	MET
1	B	27	ASN
1	B	28	ARG
1	B	48	SER
1	B	50	GLU
1	B	53	PHE
1	B	54	LEU
1	B	58	THR
1	B	78	HIS
1	B	86	ILE
1	B	101	ILE
1	B	105	ILE
1	B	109	THR
1	B	113	ASP
1	B	119	ILE
1	B	127	ILE
1	B	132	ASN
1	B	134	SER

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Mol	Chain	Res	Type
1	B	181	ASP
1	B	196	GLU
1	B	201	LEU
1	B	206	THR
1	B	213	ILE
1	B	222	GLU
1	B	255	LEU
1	B	275	SER
1	B	285	LYS
1	B	312	ASP
1	B	314	ASP
1	B	317	TYR
1	B	326	ARG
1	B	329	SER
1	B	345	LEU
1	B	350	TRP
1	B	402	GLU
1	B	418	LEU
1	B	432	MET
1	B	433	GLN
1	B	457	ASP
1	B	464	SER
1	B	468	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	256	ASN
1	A	372	ASN
1	A	393	GLN
1	A	463	ASN
1	B	393	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 monosaccharides in this entry.

5.6 Ligand geometry ⓘ

4 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	UPG	A	502	-	35,38,38	0.41	0	53,58,58	0.91	3 (5%)
2	T83	B	501	-	15,15,15	3.40	7 (46%)	21,21,21	1.60	4 (19%)
3	UPG	B	502	-	35,38,38	0.41	0	53,58,58	0.78	2 (3%)
2	T83	A	501	-	15,15,15	3.33	7 (46%)	21,21,21	2.11	6 (28%)

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	UPG	A	502	-	-	5/23/59/59	0/3/3/3
2	T83	B	501	-	-	0/2/2/2	0/2/2/2
3	UPG	B	502	-	-	5/23/59/59	0/3/3/3
2	T83	A	501	-	-	2/2/2/2	0/2/2/2

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	501	T83	OAB-CAL	9.14	1.40	1.21
2	B	501	T83	OAB-CAL	9.06	1.40	1.21
2	B	501	T83	CAD-CAE	5.52	1.44	1.34
2	A	501	T83	CAD-CAE	5.42	1.43	1.34
2	B	501	T83	OAI-CAL	-3.59	1.32	1.38
2	A	501	T83	OAI-CAL	-3.54	1.32	1.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	501	T83	CAF-CAN	3.36	1.44	1.38
2	B	501	T83	OAH-CAK	3.21	1.42	1.37
2	A	501	T83	CAF-CAN	3.16	1.44	1.38
2	A	501	T83	OAH-CAK	2.79	1.41	1.37
2	A	501	T83	OAC-CAJ	2.64	1.41	1.36
2	B	501	T83	CAG-CAM	2.39	1.44	1.40
2	B	501	T83	OAC-CAJ	2.29	1.41	1.36
2	A	501	T83	CAD-CAL	-2.03	1.40	1.44

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	501	T83	OAB-CAL-CAD	-4.73	117.20	126.00
2	A	501	T83	OAH-CAK-CAJ	3.96	120.30	114.57
2	B	501	T83	OAB-CAL-CAD	-3.63	119.25	126.00
2	A	501	T83	OAI-CAL-OAB	3.43	120.81	116.44
2	A	501	T83	CAM-CAE-CAD	-3.41	116.86	121.54
3	B	502	UPG	PB-O3B-C1'	3.23	132.21	119.74
2	A	501	T83	OAI-CAL-CAD	3.20	121.99	117.12
3	A	502	UPG	O3A-PB-O3B	-3.13	96.16	102.48
2	B	501	T83	OAI-CAL-CAD	3.09	121.82	117.12
2	B	501	T83	CAM-CAE-CAD	-3.00	117.43	121.54
3	B	502	UPG	O3A-PB-O3B	-2.39	97.66	102.48
2	A	501	T83	OAH-CAK-CAG	-2.31	120.14	124.12
2	B	501	T83	OAH-CAK-CAJ	2.30	117.90	114.57
3	A	502	UPG	PB-O3A-PA	2.13	140.14	132.83
3	A	502	UPG	C1'-O5'-C5'	2.05	117.71	113.69

There are no chirality outliers.

All (12) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	502	UPG	PB-O3A-PA-O5C
3	B	502	UPG	O5'-C1'-O3B-PB
3	A	502	UPG	C2'-C1'-O3B-PB
2	A	501	T83	CAJ-CAK-OAH-CAA
2	A	501	T83	CAG-CAK-OAH-CAA
3	B	502	UPG	PA-O3A-PB-O3B
3	B	502	UPG	O4C-C4C-C5C-O5C
3	A	502	UPG	O4C-C4C-C5C-O5C
3	B	502	UPG	C1'-O3B-PB-O3A
3	A	502	UPG	C5C-O5C-PA-O3A

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Mol	Chain	Res	Type	Atoms
3	B	502	UPG	C1'-O3B-PB-O1B
3	A	502	UPG	C1'-O3B-PB-O3A

There are no ring outliers.

2 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	502	UPG	1	0
3	B	502	UPG	4	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 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 UPG A 502

Bond lengths

Bond angles

Torsions

Rings

Ligand T83 B 501

Bond lengths

Bond angles

Torsions

Rings

Ligand UPG B 502

Bond lengths

Bond angles

Torsions

Rings

Ligand T83 A 501

Bond lengths

Bond angles

Torsions

Rings
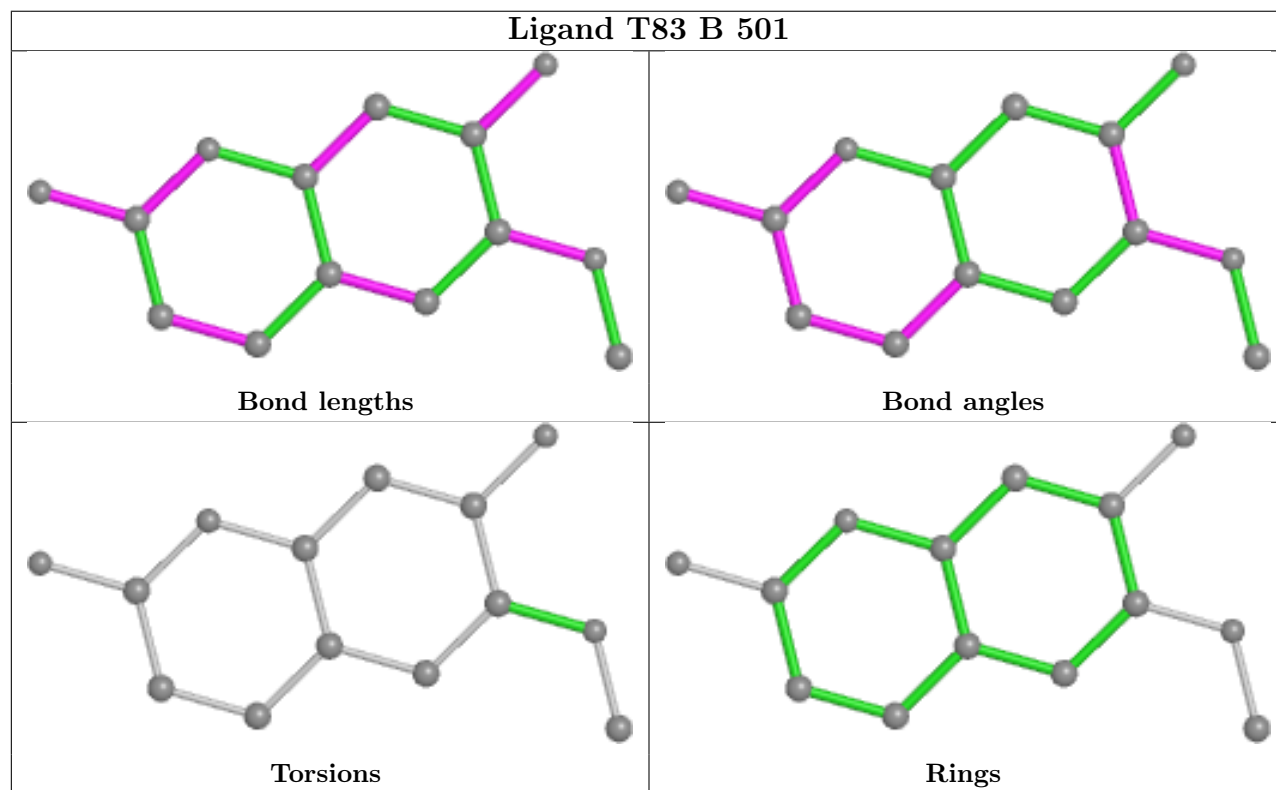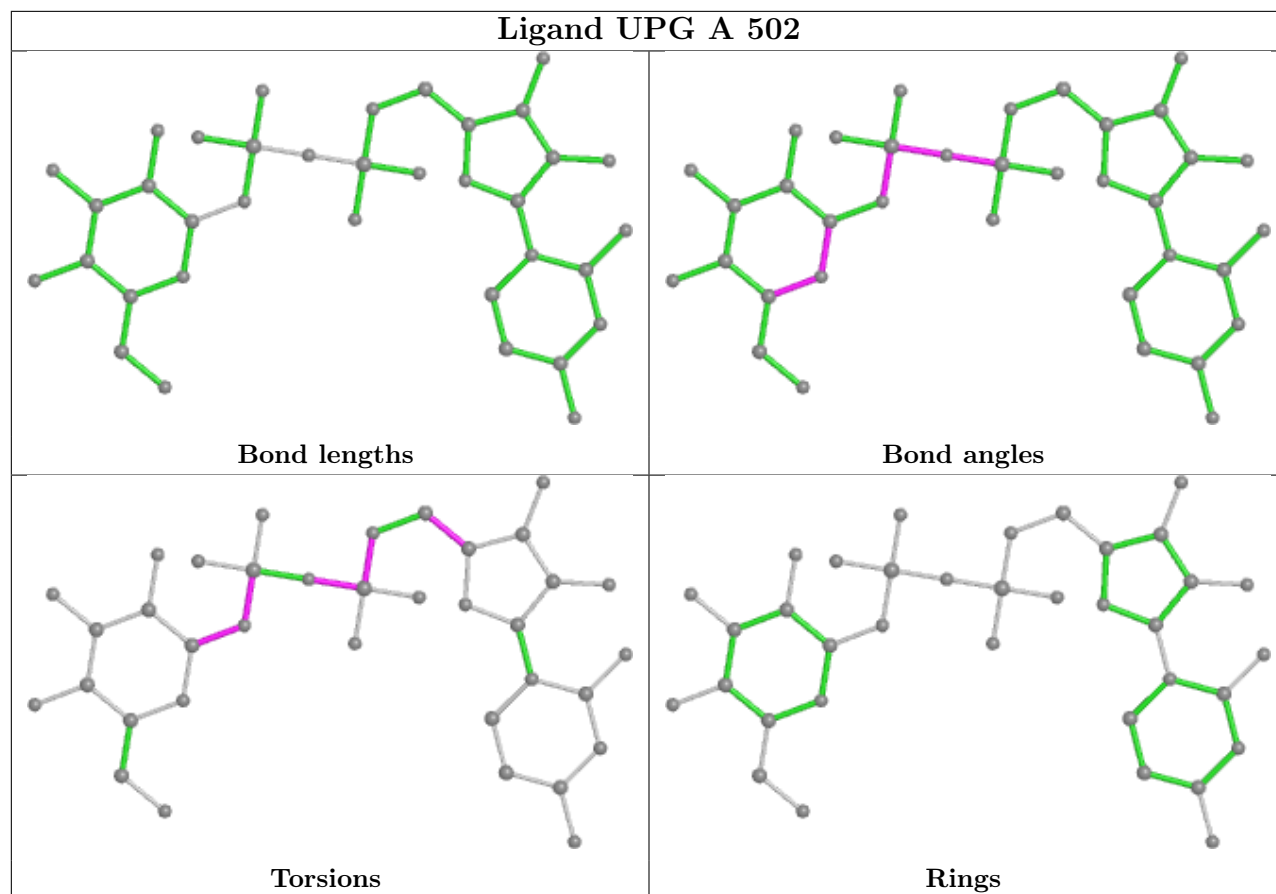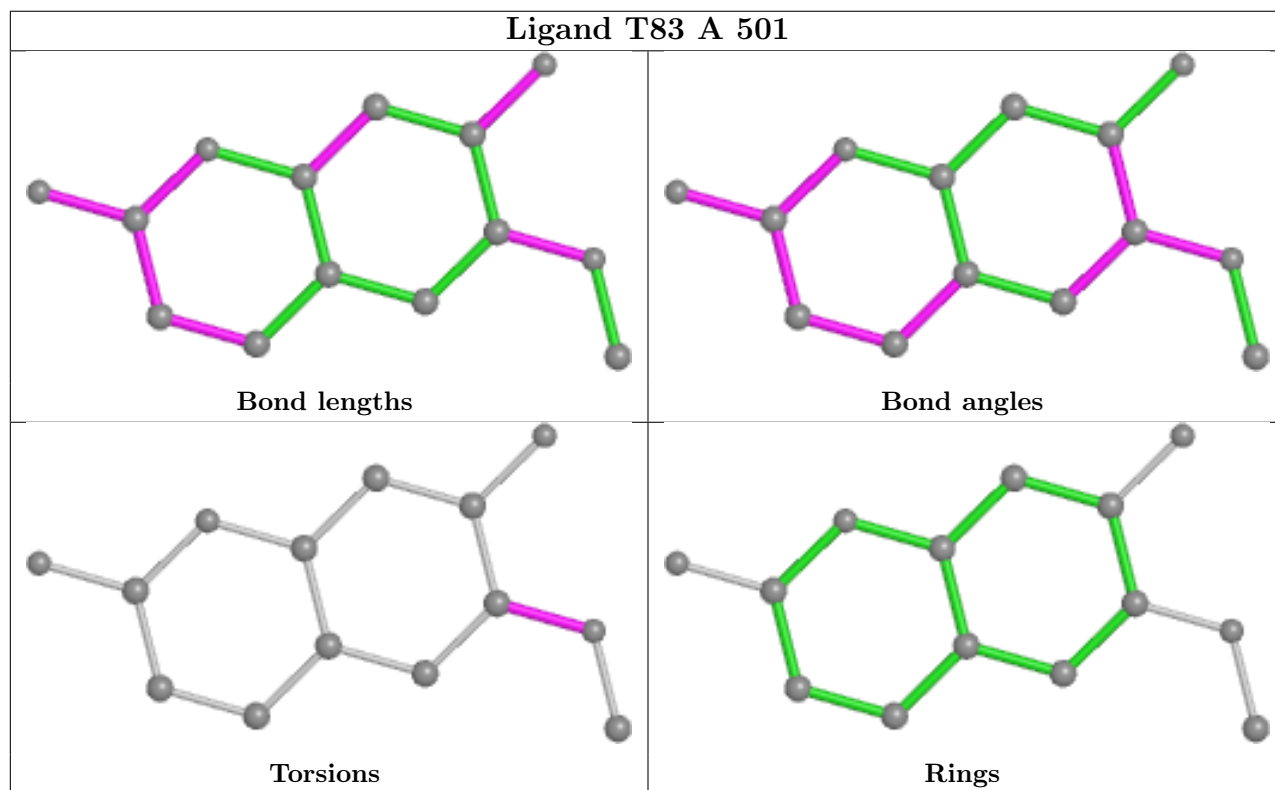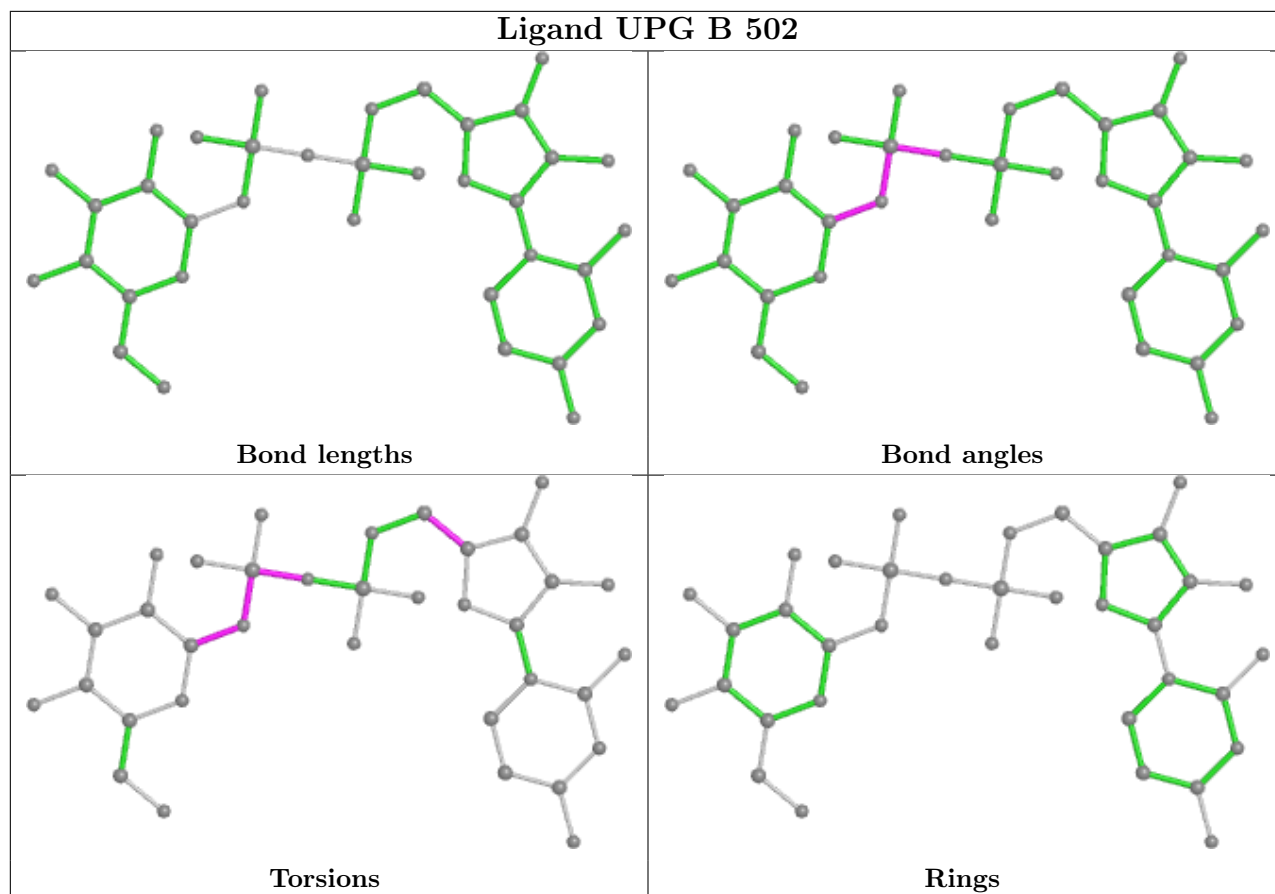
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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	477/482 (98%)	-0.14	9 (1%)	66	53	37, 65, 127, 168	0
1	B	477/482 (98%)	0.29	37 (7%)	13	6	30, 81, 156, 197	0
All	All	954/964 (98%)	0.07	46 (4%)	30	17	30, 73, 141, 197	0

All (46) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	325	THR	7.9
1	B	322	GLY	6.7
1	A	324	ASP	5.3
1	B	49	ALA	4.7
1	B	35	ILE	4.3
1	B	255	LEU	4.0
1	A	322	GLY	3.6
1	B	46	SER	3.6
1	B	323	LYS	3.6
1	B	60	THR	3.6
1	B	4	SER	3.5
1	B	256	ASN	3.4
1	B	48	SER	3.4
1	B	321	ALA	3.3
1	A	326	ARG	3.2
1	A	1	MET	3.1
1	B	477	LEU	3.0
1	B	257	ASP	3.0
1	B	62	GLU	2.9
1	B	53	PHE	2.9
1	B	327	ASP	2.9
1	B	52	GLU	2.9
1	B	65	THR	2.8
1	B	336	PHE	2.8

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Mol	Chain	Res	Type	RSRZ
1	B	32	HIS	2.8
1	B	261	GLN	2.7
1	B	1	MET	2.7
1	A	327	ASP	2.6
1	A	477	LEU	2.6
1	B	47	SER	2.5
1	B	3	SER	2.5
1	B	258	GLU	2.5
1	B	320	SER	2.5
1	B	253	THR	2.4
1	B	252	GLU	2.4
1	A	2	ASP	2.4
1	B	328	MET	2.3
1	A	51	THR	2.3
1	B	319	ASN	2.3
1	B	342	ASP	2.3
1	B	334	GLU	2.3
1	B	312	ASP	2.2
1	B	163	TYR	2.2
1	B	338	THR	2.2
1	B	345	LEU	2.0
1	B	311	GLY	2.0

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 ⓘ

There are no monosaccharides in this entry.

6.4 Ligands ⓘ

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	T83	B	501	14/14	0.89	0.41	80,102,123,129	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($Å^2$)	Q<0.9
2	T83	A	501	14/14	0.91	0.33	79,85,92,93	0
3	UPG	B	502	36/36	0.96	0.17	47,65,130,139	0
3	UPG	A	502	36/36	0.97	0.20	42,59,125,133	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.
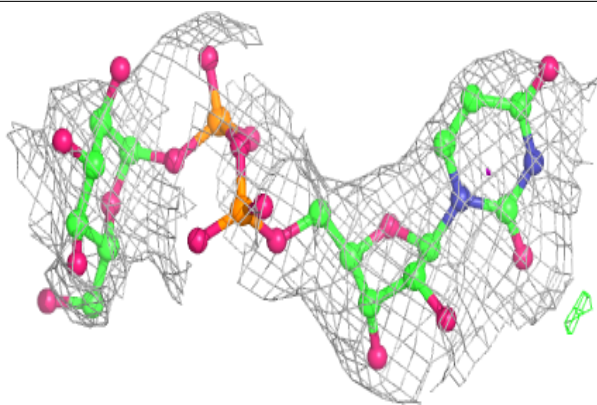

Electron density around T83 B 501:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
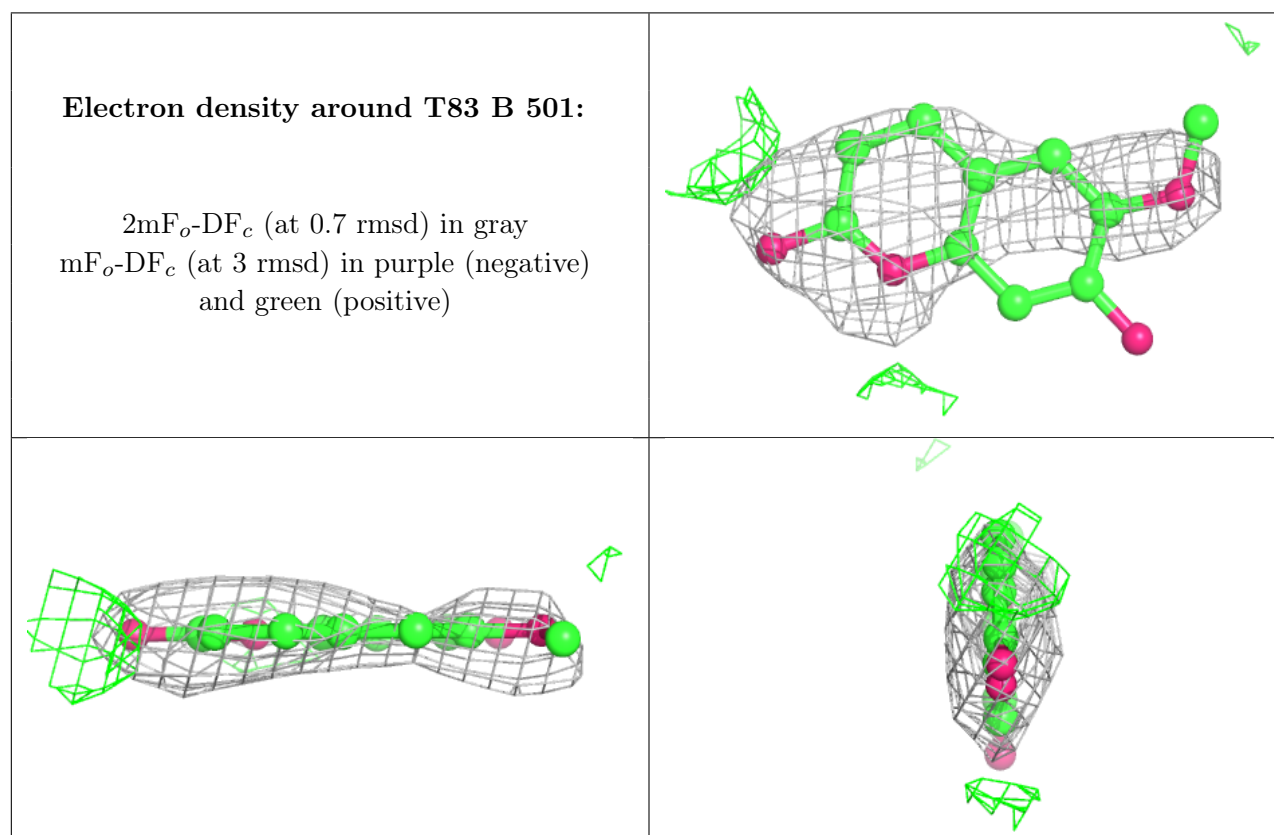
Electron density around T83 A 501:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
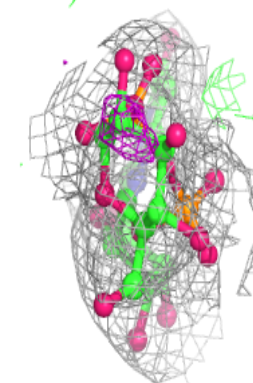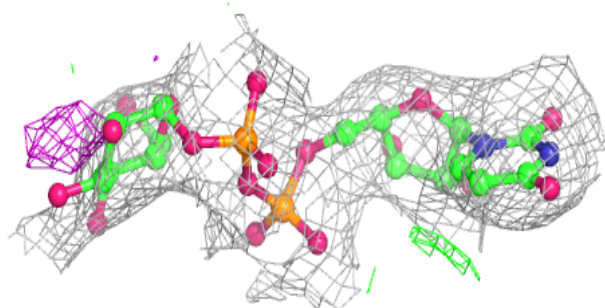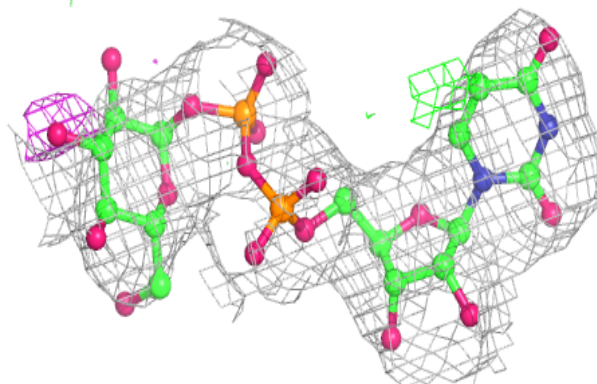and green (positive)
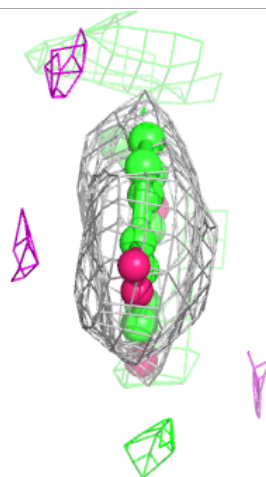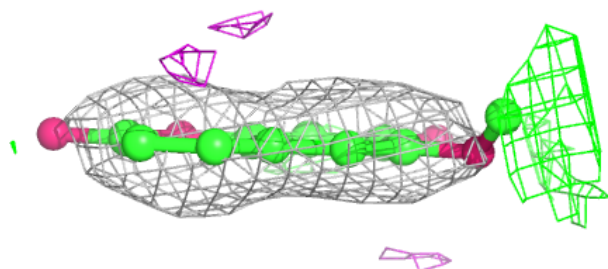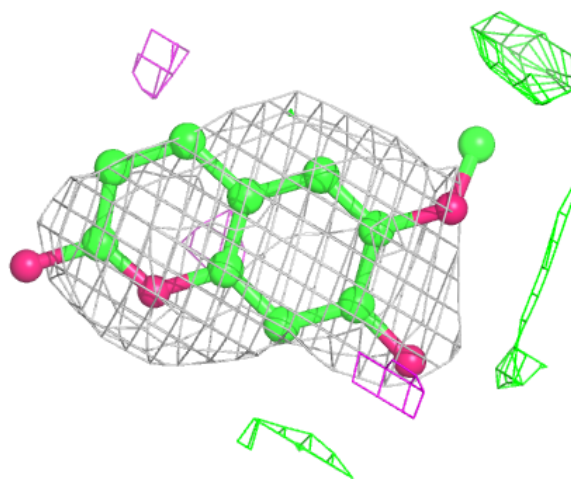
Electron density around UPG B 502:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
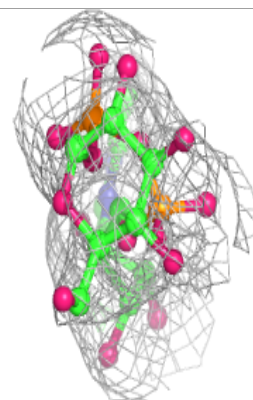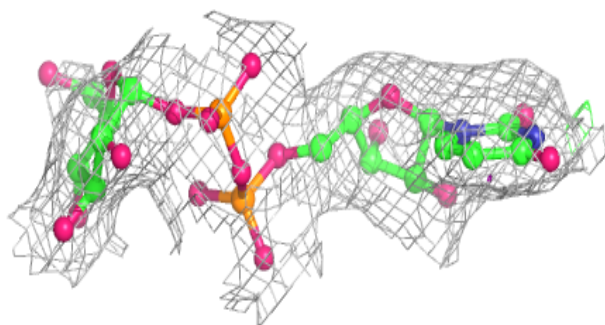
Electron density around UPG A 502:

$2mF_o$-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 ⓘ

There are no such residues in this entry.