WORLDWIDE PDB
PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report (i)

Aug 29, 2024 – 10:09 AM JST

PDB ID	:	9J9K
Title	:	Glucosyl transferase NbUGT72AY1 co-crystallized with Scopoletin and UDP2F glucose
Authors	:	Arold, S.T.; Hameed, U.F.S.
Deposited on	:	2024-08-22
Resolution	:	3.15 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

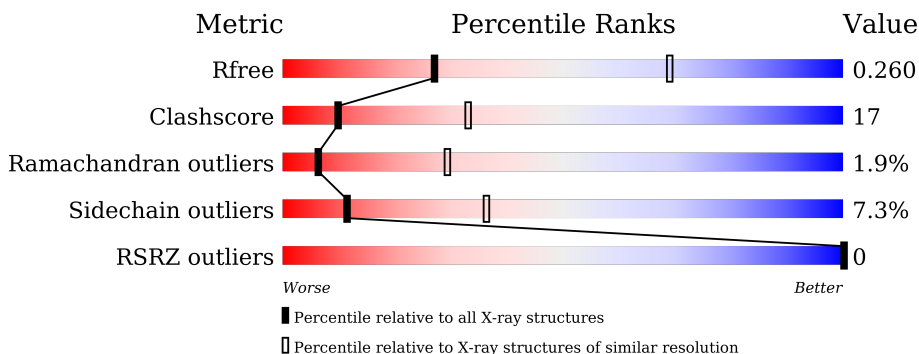|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.002 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.38.2

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		0.260
Clashscore		17
Ramachandran outliers		1.9%
Sidechain outliers		7.3%
RSRZ outliers		0

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}	164625	2168 (3.20-3.12)
Clashscore	180529	2333 (3.20-3.12)
Ramachandran outliers	177936	2266 (3.20-3.12)
Sidechain outliers	177891	2265 (3.20-3.12)
RSRZ outliers	164620	2169 (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	475	65% ... 33% ... ·
1	B	475	61% ... 33% ... · ·

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

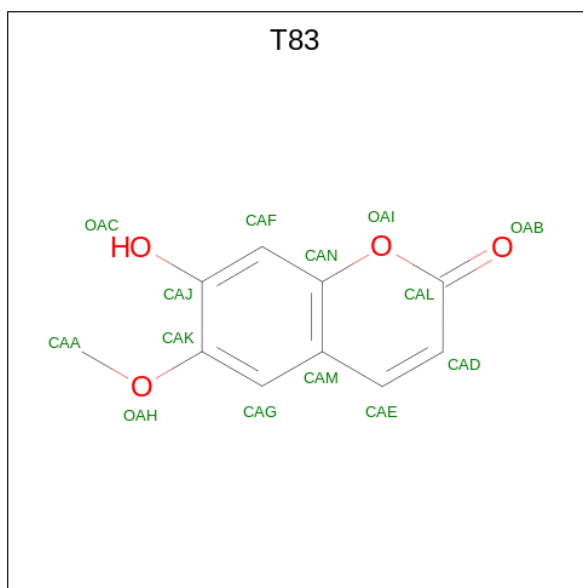| Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	T83	A	501	-	X	-	-
2	T83	B	501	-	X	-	-

2 Entry composition ⓘ

There are 3 unique types of molecules in this entry. The entry contains 7493 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	475	Total	C	N	O	S	0	0	0
			3742	2384	629	713	16			
1	B	463	Total	C	N	O	S	0	0	0
			3651	2328	615	692	16			

- 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).

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

- Molecule 3 is URIDINE-5'-DIPHOSPHATE-2-DEOXY-2-FLUORO-ALPHA-D-GLUCOSE (three-letter code: U2F) (formula: $C_{15}H_{23}FN_2O_{16}P_2$) (labeled as "Ligand of Interest" by depositor).
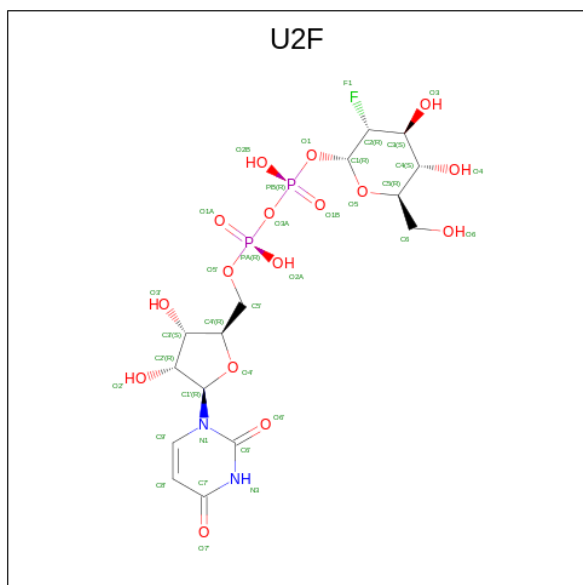
U2F

| Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
3	A	1	Total	C	F	N	O	P	0	0
			36	15	1	2	16	2		
3	B	1	Total	C	F	N	O	P	0	0
			36	15	1	2	16	2		

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:
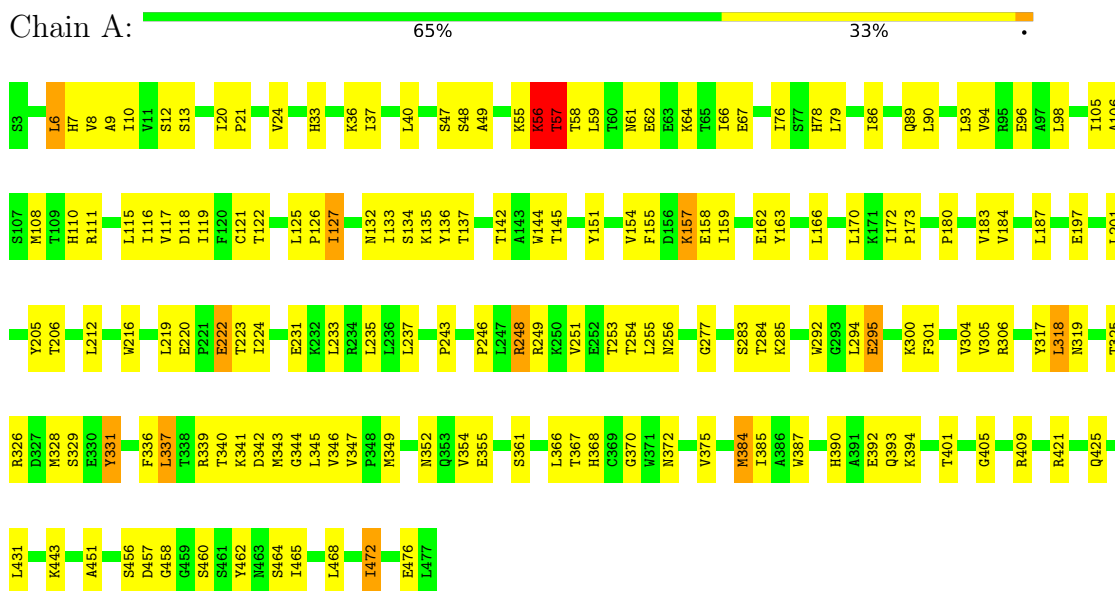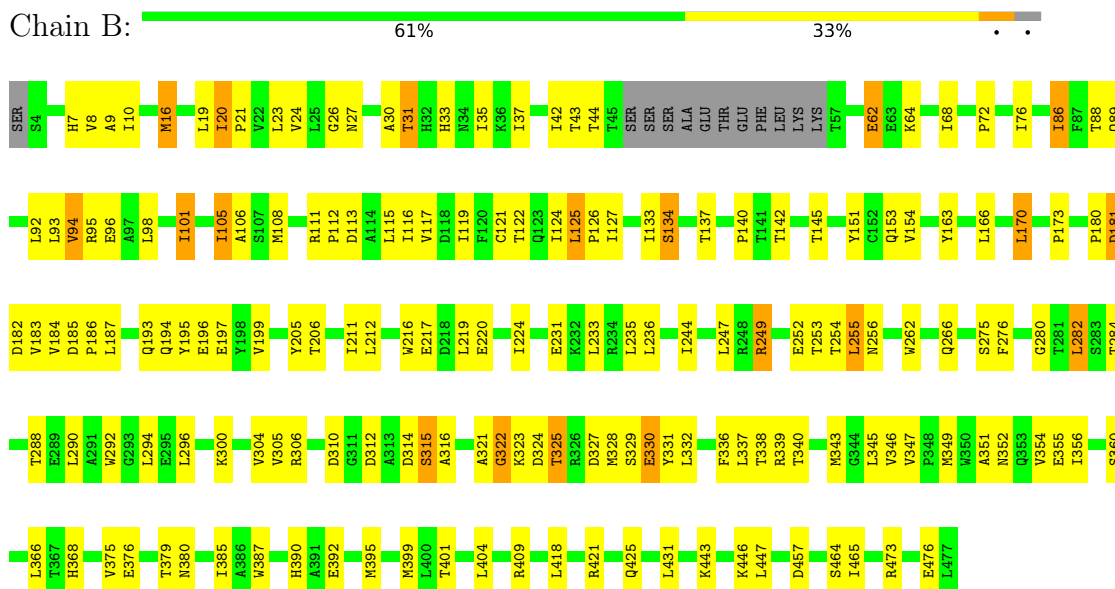
4 Data and refinement statistics ⓘ

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 46.83 – 3.15	Depositor EDS
% Data completeness (in resolution range)	98.2 (46.83-3.15) 98.2 (46.83-3.15)	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 Refmac5	Depositor
R, R_{free}	0.190 , 0.258 0.197 , 0.260	Depositor DCC
R_{free} test set	930 reflections (4.53%)	wwPDB-VP
Wilson B-factor (Å^2)	70.4	Xtriage
Anisotropy	0.360	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 69.1	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	7493	wwPDB-VP
Average B, all atoms (Å^2)	78.0	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 ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: U2F, 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	0.43	0/3815	0.67	0/5176
1	B	0.42	0/3722	0.65	0/5051
All	All	0.42	0/7537	0.66	0/10227

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	3
All	All	0	5

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	248	ARG	Sidechain
1	A	339	ARG	Sidechain
1	B	249	ARG	Sidechain
1	B	473	ARG	Sidechain
1	B	95	ARG	Sidechain

5.2 Too-close contacts (i)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3742	0	3818	106	0
1	B	3651	0	3727	151	0
2	A	14	0	0	0	0
2	B	14	0	0	0	0
3	A	36	0	21	3	0
3	B	36	0	21	1	0
All	All	7493	0	7587	259	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 17.

All (259) 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:306:ARG:NH1	1:A:349:MET:O	2.02	0.92
1:B:20:ILE:HD12	1:B:21:PRO:HD3	1.54	0.90
1:A:277:GLY:O	1:A:306:ARG:NH2	2.07	0.88
1:B:20:ILE:CD1	1:B:21:PRO:HD3	2.03	0.88
1:B:16:MET:HE2	1:B:16:MET:HA	1.55	0.87
1:B:20:ILE:HD12	1:B:21:PRO:CD	2.05	0.85
1:B:98:LEU:HA	1:B:101:ILE:CD1	2.13	0.79
1:B:376:GLU:O	1:B:380:ASN:OD1	2.04	0.76
1:B:184:VAL:HG13	1:B:395:MET:CE	2.17	0.75
1:B:86:ILE:H	1:B:86:ILE:HD12	1.50	0.75
1:A:125:LEU:HD12	1:A:135:LYS:HD2	1.68	0.75
1:A:21:PRO:HG3	1:A:372:ASN:HD21	1.53	0.74
1:B:352:ASN:O	1:B:356:ILE:HD12	1.86	0.74
1:A:155:PHE:O	1:A:159:ILE:HD13	1.88	0.73
1:A:370:GLY:HA3	3:A:502:U2F:O2A	1.89	0.72
1:A:158:GLU:O	1:A:159:ILE:HD12	1.89	0.72
1:B:163:TYR:CD2	1:B:187:LEU:HD23	2.25	0.72
1:B:231:GLU:O	1:B:235:LEU:HD13	1.90	0.71
1:B:16:MET:O	1:B:20:ILE:HG13	1.90	0.70
1:B:401:THR:OG1	1:B:409:ARG:NH1	2.25	0.69
1:A:21:PRO:HG3	1:A:372:ASN:ND2	2.07	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:220:GLU:O	1:B:224:ILE:HG13	1.92	0.69
1:B:16:MET:HA	1:B:16:MET:CE	2.23	0.69
1:A:158:GLU:C	1:A:159:ILE:HD12	2.13	0.69
1:A:163:TYR:HA	1:A:166:LEU:HD13	1.74	0.68
1:B:98:LEU:HA	1:B:101:ILE:HD11	1.74	0.68
1:A:21:PRO:CG	1:A:372:ASN:HD21	2.07	0.66
1:B:328:MET:HA	1:B:331:TYR:CZ	2.31	0.66
1:B:21:PRO:HA	1:B:24:VAL:HG22	1.77	0.65
1:B:404:LEU:HD23	1:B:447:LEU:HD11	1.78	0.65
1:B:125:LEU:HB2	1:B:126:PRO:HD3	1.79	0.64
1:A:106:ALA:HA	1:A:111:ARG:HH12	1.60	0.64
1:B:290:LEU:O	1:B:294:LEU:HD13	1.96	0.64
1:B:88:THR:O	1:B:92:LEU:HG	1.97	0.64
1:A:337:LEU:HD12	1:A:337:LEU:H	1.62	0.64
1:A:89:GLN:O	1:A:93:LEU:HD12	1.98	0.64
1:B:184:VAL:CG2	1:B:187:LEU:HD12	2.28	0.64
1:B:305:VAL:HG11	1:B:346:VAL:CG1	2.28	0.63
1:A:20:ILE:O	1:A:24:VAL:HG23	1.99	0.63
1:B:255:LEU:HD13	1:B:256:ASN:H	1.62	0.63
1:B:19:LEU:HD13	1:B:23:LEU:HD23	1.82	0.62
1:B:184:VAL:HG22	1:B:187:LEU:CD1	2.30	0.62
1:B:255:LEU:HD13	1:B:256:ASN:N	2.15	0.62
1:B:19:LEU:CD1	1:B:23:LEU:HD23	2.30	0.62
1:A:33:HIS:CE1	1:A:465:ILE:HG21	2.36	0.61
1:A:251:VAL:HG22	1:A:354:VAL:HG12	1.81	0.61
1:B:306:ARG:HA	1:B:349:MET:HE1	1.83	0.61
1:B:43:THR:OG1	1:B:72:PRO:HA	2.00	0.61
1:B:19:LEU:HD13	1:B:19:LEU:O	2.02	0.60
1:A:47:SER:O	1:A:49:ALA:N	2.35	0.59
1:B:20:ILE:HD13	1:B:21:PRO:HD3	1.83	0.59
1:A:283:SER:O	1:A:285:LYS:N	2.35	0.59
1:A:98:LEU:C	1:A:98:LEU:HD23	2.23	0.59
1:A:294:LEU:O	1:A:295:GLU:HB2	2.02	0.59
1:B:217:GLU:HA	1:B:224:ILE:HD12	1.85	0.59
1:B:328:MET:HA	1:B:331:TYR:OH	2.02	0.59
1:A:90:LEU:HA	1:A:93:LEU:HD12	1.85	0.59
1:B:119:ILE:HG13	1:B:205:TYR:OH	2.03	0.58
1:B:262:TRP:CD2	1:B:345:LEU:HD13	2.38	0.58
1:B:33:HIS:CE1	1:B:465:ILE:HG21	2.38	0.58
3:A:502:U2F:H9'	3:A:502:U2F:H5'1	1.86	0.58
1:B:266:GLN:OE1	1:B:300:LYS:HD2	2.04	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:163:TYR:HA	1:A:166:LEU:CD1	2.34	0.57
1:A:294:LEU:O	1:A:295:GLU:CB	2.51	0.57
1:B:16:MET:O	1:B:20:ILE:CD1	2.52	0.57
1:A:367:THR:HG21	1:A:384:MET:CE	2.35	0.56
1:A:106:ALA:HA	1:A:111:ARG:NH1	2.20	0.56
1:A:119:ILE:HG13	1:A:205:TYR:OH	2.05	0.56
1:B:26:GLY:O	1:B:37:ILE:HD13	2.05	0.56
1:A:184:VAL:HG12	1:A:392:GLU:HA	1.86	0.56
1:A:341:LYS:O	1:A:342:ASP:HB2	2.05	0.56
1:A:392:GLU:OE1	3:A:502:U2F:O3	2.23	0.56
1:B:20:ILE:HD12	1:B:21:PRO:HD2	1.88	0.56
1:B:21:PRO:HA	1:B:24:VAL:CG2	2.35	0.56
1:B:86:ILE:H	1:B:86:ILE:CD1	2.18	0.56
1:B:101:ILE:O	1:B:105:ILE:HD12	2.06	0.56
1:A:328:MET:SD	1:A:331:TYR:HE2	2.29	0.56
1:B:249:ARG:NH2	1:B:354:VAL:HG23	2.21	0.56
1:A:231:GLU:O	1:A:235:LEU:HD13	2.04	0.56
1:B:163:TYR:HD2	1:B:187:LEU:HD23	1.68	0.56
1:B:354:VAL:HG22	1:B:376:GLU:OE1	2.06	0.55
1:B:312:ASP:CG	1:B:315:SER:HA	2.26	0.55
1:B:88:THR:HG21	1:B:193:GLN:HB3	1.89	0.55
1:B:212:LEU:HD12	1:B:212:LEU:N	2.22	0.55
1:B:68:ILE:HD12	1:B:68:ILE:N	2.22	0.55
1:B:292:TRP:CD1	1:B:421:ARG:NH2	2.74	0.55
1:B:163:TYR:CE2	1:B:187:LEU:HD23	2.42	0.55
1:B:86:ILE:HD12	1:B:86:ILE:N	2.18	0.54
1:B:117:VAL:HB	1:B:121:CYS:HB2	1.90	0.54
1:B:305:VAL:CG1	1:B:346:VAL:CG1	2.85	0.54
1:A:55:LYS:O	1:A:57:THR:N	2.39	0.53
1:B:98:LEU:O	1:B:101:ILE:HD13	2.08	0.53
1:A:98:LEU:HD21	1:A:127:ILE:HD11	1.90	0.53
1:A:456:SER:O	1:A:458:GLY:O	2.25	0.53
1:B:106:ALA:HA	1:B:111:ARG:HH12	1.74	0.53
1:A:6:LEU:HD13	1:A:472:ILE:HG21	1.91	0.53
1:A:336:PHE:O	1:A:340:THR:HG23	2.07	0.53
1:B:312:ASP:OD1	1:B:315:SER:HA	2.09	0.53
1:A:172:ILE:HD12	1:A:172:ILE:H	1.73	0.53
1:B:88:THR:HG23	1:B:194:GLN:HB3	1.91	0.52
1:B:296:LEU:HB3	1:B:425:GLN:NE2	2.24	0.52
1:A:13:SER:OG	1:A:118:ASP:OD2	2.28	0.52
1:B:337:LEU:HD12	1:B:337:LEU:H	1.73	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:180:PRO:O	1:A:183:VAL:HG13	2.10	0.52
1:A:8:VAL:HB	1:A:37:ILE:CD1	2.40	0.52
1:A:125:LEU:CD1	1:A:135:LYS:HD2	2.38	0.51
1:B:196:GLU:HG3	1:B:197:GLU:N	2.26	0.51
1:B:106:ALA:HA	1:B:111:ARG:NH1	2.26	0.51
1:A:61:ASN:HB3	1:A:66:ILE:HD12	1.93	0.51
1:A:117:VAL:HB	1:A:121:CYS:HB2	1.92	0.51
1:B:280:GLY:O	1:B:306:ARG:NH2	2.43	0.51
3:B:502:U2F:F1	3:B:502:U2F:O1A	2.19	0.51
1:B:20:ILE:CD1	1:B:21:PRO:CD	2.75	0.51
1:A:305:VAL:CG1	1:A:346:VAL:HG13	2.41	0.50
1:B:119:ILE:HD12	1:B:140:PRO:HD2	1.92	0.50
1:B:314:ASP:HB3	1:B:390:HIS:NE2	2.26	0.50
1:B:19:LEU:HD13	1:B:19:LEU:C	2.32	0.50
1:A:89:GLN:C	1:A:93:LEU:HD12	2.31	0.50
1:B:27:ASN:O	1:B:31:THR:OG1	2.26	0.50
1:B:180:PRO:O	1:B:183:VAL:HG13	2.11	0.50
1:B:184:VAL:HG13	1:B:395:MET:HE2	1.94	0.50
1:A:137:THR:HG21	1:A:205:TYR:HD1	1.77	0.50
1:B:385:ILE:HG13	1:B:431:LEU:HD22	1.94	0.50
1:A:106:ALA:CA	1:A:111:ARG:HH12	2.25	0.50
1:B:184:VAL:HG22	1:B:187:LEU:HD13	1.93	0.49
1:B:16:MET:O	1:B:20:ILE:CG1	2.58	0.49
1:B:443:LYS:HA	1:B:446:LYS:HE3	1.94	0.49
1:B:321:ALA:O	1:B:322:GLY:C	2.50	0.49
1:B:119:ILE:CG1	1:B:205:TYR:OH	2.60	0.49
1:B:262:TRP:CD2	1:B:345:LEU:CD1	2.96	0.49
1:A:224:ILE:HD13	1:A:243:PRO:CG	2.43	0.49
1:B:219:LEU:HD11	1:B:404:LEU:HD21	1.94	0.49
1:A:86:ILE:CD1	1:A:318:LEU:HD23	2.43	0.49
1:A:390:HIS:CE1	1:A:393:GLN:HE22	2.30	0.48
1:B:184:VAL:HG23	1:B:186:PRO:HD2	1.96	0.48
1:B:7:HIS:HE1	1:B:108:MET:HE1	1.78	0.48
1:A:6:LEU:CD1	1:A:472:ILE:HG21	2.43	0.48
1:B:76:ILE:HG22	1:B:96:GLU:HG3	1.95	0.48
1:B:300:LYS:HA	1:B:343:MET:O	2.12	0.48
1:A:157:LYS:HA	1:A:157:LYS:CE	2.42	0.48
1:A:78:HIS:CD2	1:A:78:HIS:H	2.30	0.48
1:A:249:ARG:NH2	1:A:354:VAL:HG23	2.28	0.48
1:B:142:THR:OG1	1:B:145:THR:HG23	2.14	0.48
1:A:222:GLU:H	1:A:222:GLU:HG3	1.31	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:76:ILE:HG12	1:B:93:LEU:HD13	1.95	0.47
1:B:219:LEU:CD1	1:B:404:LEU:HD21	2.45	0.47
1:A:86:ILE:HD12	1:A:318:LEU:HD23	1.95	0.47
1:A:300:LYS:HA	1:A:343:MET:O	2.14	0.47
1:B:105:ILE:HA	1:B:108:MET:HG3	1.96	0.47
1:B:327:ASP:O	1:B:329:SER:O	2.32	0.47
1:B:89:GLN:O	1:B:93:LEU:CD2	2.62	0.47
1:A:94:VAL:HG11	1:A:121:CYS:HA	1.97	0.47
1:A:246:PRO:HB2	1:A:375:VAL:HG13	1.96	0.47
1:B:323:LYS:O	1:B:325:THR:N	2.47	0.47
1:A:385:ILE:HG13	1:A:431:LEU:HD22	1.96	0.47
1:B:338:THR:OG1	1:B:339:ARG:N	2.48	0.47
1:B:219:LEU:HD11	1:B:404:LEU:CD2	2.45	0.46
1:B:252:GLU:HG2	1:B:355:GLU:OE2	2.14	0.46
1:B:184:VAL:HG12	1:B:392:GLU:HA	1.96	0.46
1:B:101:ILE:O	1:B:105:ILE:CD1	2.63	0.46
1:B:30:ALA:HB2	1:B:37:ILE:HD12	1.98	0.46
1:A:9:ALA:HB3	1:A:115:LEU:HD12	1.97	0.46
1:B:10:ILE:HA	1:B:116:ILE:O	2.16	0.46
1:B:312:ASP:OD2	1:B:315:SER:HA	2.16	0.46
1:B:332:LEU:HD23	1:B:336:PHE:CD2	2.51	0.46
1:A:10:ILE:HA	1:A:116:ILE:O	2.16	0.46
1:A:105:ILE:HA	1:A:108:MET:HG3	1.97	0.46
1:A:144:TRP:HA	1:A:223:THR:HG21	1.96	0.46
1:A:352:ASN:HB3	1:A:355:GLU:OE1	2.15	0.46
1:B:9:ALA:HB3	1:B:115:LEU:HD12	1.98	0.46
1:B:399:MET:O	1:B:404:LEU:HD12	2.16	0.46
1:B:476:GLU:OE1	1:B:476:GLU:N	2.49	0.46
1:A:125:LEU:HB3	1:A:126:PRO:HD3	1.98	0.45
1:B:7:HIS:ND1	1:B:112:PRO:HA	2.31	0.45
1:B:304:VAL:HA	1:B:347:VAL:O	2.16	0.45
1:B:352:ASN:C	1:B:356:ILE:HD12	2.37	0.45
1:B:329:SER:O	1:B:330:GLU:CB	2.63	0.45
1:B:262:TRP:CE2	1:B:345:LEU:CD1	2.99	0.45
1:A:304:VAL:HA	1:A:347:VAL:O	2.17	0.45
1:B:153:GLN:NE2	1:B:236:LEU:HD22	2.32	0.45
1:A:405:GLY:O	1:A:443:LYS:HD2	2.17	0.45
1:B:184:VAL:CG2	1:B:187:LEU:CD1	2.90	0.44
1:B:336:PHE:CE2	1:B:340:THR:HG21	2.52	0.44
1:B:133:ILE:HG22	1:B:134:SER:O	2.17	0.44
1:B:184:VAL:CG1	1:B:395:MET:CE	2.91	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:401:THR:CB	1:B:409:ARG:HH11	2.30	0.44
1:A:162:GLU:O	1:A:166:LEU:HD12	2.17	0.44
1:A:305:VAL:HG11	1:A:346:VAL:HG13	1.99	0.44
1:A:212:LEU:HD11	1:A:468:LEU:HD22	2.00	0.44
1:B:375:VAL:O	1:B:379:THR:HG23	2.18	0.43
1:A:249:ARG:CZ	1:A:354:VAL:HG23	2.48	0.43
1:B:137:THR:HG23	1:B:211:ILE:HG23	1.99	0.43
1:A:7:HIS:CD2	1:A:36:LYS:HE3	2.54	0.43
1:A:246:PRO:CG	1:A:451:ALA:HB1	2.49	0.43
1:A:462:TYR:CD1	1:A:462:TYR:C	2.91	0.43
1:B:366:LEU:C	1:B:366:LEU:HD23	2.39	0.43
1:A:301:PHE:CZ	1:A:344:GLY:HA3	2.52	0.43
1:B:315:SER:O	1:B:316:ALA:HB3	2.18	0.43
1:A:170:LEU:N	1:A:170:LEU:HD12	2.34	0.43
1:A:253:THR:HG22	1:A:255:LEU:CD2	2.48	0.43
1:A:56:LYS:H	1:A:56:LYS:HG3	1.57	0.43
1:A:326:ARG:HB3	1:A:331:TYR:HE1	1.82	0.43
1:B:170:LEU:N	1:B:170:LEU:HD13	2.34	0.43
1:A:216:TRP:CZ3	1:A:219:LEU:HD22	2.54	0.43
1:B:16:MET:O	1:B:20:ILE:HD12	2.18	0.43
1:B:127:ILE:N	1:B:127:ILE:HD12	2.33	0.43
1:A:61:ASN:HA	1:A:64:LYS:HG3	2.00	0.42
1:A:86:ILE:HD12	1:A:318:LEU:CD2	2.48	0.42
1:B:8:VAL:HG21	1:B:35:ILE:HD13	2.00	0.42
1:A:98:LEU:HD23	1:A:98:LEU:O	2.18	0.42
1:B:262:TRP:CE3	1:B:345:LEU:HD13	2.54	0.42
1:B:312:ASP:OD1	1:B:312:ASP:N	2.49	0.42
1:A:76:ILE:HG22	1:A:96:GLU:HG3	2.01	0.42
1:B:124:ILE:O	1:B:125:LEU:C	2.58	0.42
1:A:133:ILE:HG22	1:A:134:SER:O	2.19	0.42
1:B:244:ILE:HD12	1:B:247:LEU:HD11	2.02	0.42
1:B:347:VAL:HG11	1:B:351:ALA:HB2	2.01	0.42
1:A:151:TYR:CZ	1:A:154:VAL:HG11	2.54	0.42
1:A:328:MET:HA	1:A:331:TYR:CE2	2.55	0.42
1:B:89:GLN:O	1:B:93:LEU:HD23	2.19	0.42
1:A:368:HIS:HA	1:A:387:TRP:O	2.19	0.42
1:A:401:THR:HG21	1:A:409:ARG:HD3	2.02	0.42
1:B:216:TRP:CZ3	1:B:219:LEU:HD22	2.55	0.42
1:B:231:GLU:OE1	1:B:231:GLU:HA	2.20	0.42
1:A:90:LEU:HA	1:A:93:LEU:CD1	2.48	0.42
1:A:367:THR:HG21	1:A:384:MET:HE3	2.00	0.42

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Full wwPDB X-ray Structure Validation Report

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:401:THR:CB	1:B:409:ARG:NH1	2.83	0.42
1:A:136:TYR:CE1	1:A:472:ILE:CD1	3.03	0.42
1:A:254:THR:O	1:A:254:THR:HG23	2.20	0.42
1:B:8:VAL:CG2	1:B:35:ILE:HD13	2.49	0.42
1:B:137:THR:HG21	1:B:205:TYR:HD1	1.84	0.42
1:B:185:ASP:OD2	1:B:390:HIS:HB2	2.19	0.42
1:B:276:PHE:CE2	1:B:282:LEU:HD21	2.55	0.42
1:A:61:ASN:HA	1:A:64:LYS:CG	2.50	0.41
1:B:151:TYR:CZ	1:B:154:VAL:HG11	2.55	0.41
1:B:195:TYR:O	1:B:199:VAL:HG23	2.19	0.41
1:A:105:ILE:O	1:A:111:ARG:NH1	2.53	0.41
1:B:166:LEU:HD13	1:B:170:LEU:HD12	2.02	0.41
1:A:292:TRP:HB3	1:A:421:ARG:HD3	2.02	0.41
1:A:197:GLU:OE1	1:A:197:GLU:HA	2.21	0.41
1:A:224:ILE:HD13	1:A:243:PRO:HG3	2.03	0.41
1:B:173:PRO:HB2	1:B:233:LEU:CD1	2.51	0.41
1:B:314:ASP:HB3	1:B:390:HIS:CD2	2.56	0.41
1:B:170:LEU:N	1:B:170:LEU:CD1	2.82	0.41
1:B:290:LEU:O	1:B:294:LEU:CD1	2.67	0.41
1:B:294:LEU:HD12	1:B:294:LEU:N	2.36	0.41
1:A:142:THR:OG1	1:A:145:THR:HG23	2.20	0.40
1:A:170:LEU:N	1:A:170:LEU:CD1	2.84	0.40
1:A:366:LEU:HD23	1:A:366:LEU:C	2.42	0.40
1:B:62:GLU:H	1:B:62:GLU:HG2	1.66	0.40
1:B:249:ARG:CZ	1:B:354:VAL:HG23	2.51	0.40
1:B:443:LYS:HA	1:B:446:LYS:CE	2.51	0.40
1:B:181:ASP:OD1	1:B:181:ASP:N	2.54	0.40
1:A:86:ILE:HG23	1:A:318:LEU:CD2	2.51	0.40
1:B:368:HIS:HA	1:B:387:TRP:O	2.21	0.40
1:A:173:PRO:HB2	1:A:233:LEU:HD13	2.03	0.40
1:B:16:MET:CE	1:B:16:MET:CA	2.96	0.40
1:A:248:ARG:NH1	1:A:249:ARG:O	2.54	0.40
1:B:42:ILE:CD1	1:B:94:VAL:HG22	2.52	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	473/475 (100%)	426 (90%)	36 (8%)	11 (2%)	5	25
1	B	459/475 (97%)	423 (92%)	29 (6%)	7 (2%)	8	34
All	All	932/950 (98%)	849 (91%)	65 (7%)	18 (2%)	6	29

All (18) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	295	GLU
1	B	253	THR
1	A	319	ASN
1	A	476	GLU
1	B	322	GLY
1	A	56	LYS
1	A	122	THR
1	A	329	SER
1	B	44	THR
1	B	122	THR
1	B	330	GLU
1	A	48	SER
1	A	284	THR
1	A	317	TYR
1	A	57	THR
1	A	110	HIS
1	B	324	ASP
1	B	125	LEU

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	423/423 (100%)	390 (92%)	33 (8%)	10	34
1	B	412/423 (97%)	384 (93%)	28 (7%)	13	39
All	All	835/846 (99%)	774 (93%)	61 (7%)	11	36

All (61) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	6	LEU
1	A	12	SER
1	A	40	LEU
1	A	56	LYS
1	A	57	THR
1	A	58	THR
1	A	59	LEU
1	A	62	GLU
1	A	67	GLU
1	A	79	LEU
1	A	127	ILE
1	A	132	ASN
1	A	157	LYS
1	A	187	LEU
1	A	201	LEU
1	A	206	THR
1	A	220	GLU
1	A	222	GLU
1	A	237	LEU
1	A	256	ASN
1	A	318	LEU
1	A	325	THR
1	A	331	TYR
1	A	337	LEU
1	A	345	LEU
1	A	361	SER
1	A	384	MET
1	A	394	LYS
1	A	425	GLN
1	A	457	ASP
1	A	460	SER
1	A	464	SER
1	A	472	ILE

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Mol	Chain	Res	Type
1	B	16	MET
1	B	20	ILE
1	B	31	THR
1	B	62	GLU
1	B	64	LYS
1	B	86	ILE
1	B	94	VAL
1	B	101	ILE
1	B	105	ILE
1	B	113	ASP
1	B	134	SER
1	B	170	LEU
1	B	181	ASP
1	B	182	ASP
1	B	206	THR
1	B	254	THR
1	B	255	LEU
1	B	275	SER
1	B	282	LEU
1	B	284	THR
1	B	288	THR
1	B	310	ASP
1	B	315	SER
1	B	325	THR
1	B	360	SER
1	B	418	LEU
1	B	457	ASP
1	B	464	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	256	ASN
1	A	353	GLN
1	A	372	ASN
1	A	390	HIS
1	B	153	GLN
1	B	380	ASN

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 ⓘ

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	U2F	B	502	-	35,38,38	0.46	0	51,58,58	0.56	0
2	T83	B	501	-	15,15,15	4.13	8 (53%)	21,21,21	1.97	6 (28%)
3	U2F	A	502	-	35,38,38	0.52	0	51,58,58	0.87	2 (3%)
2	T83	A	501	-	15,15,15	4.11	8 (53%)	21,21,21	2.28	8 (38%)

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	U2F	B	502	-	-	6/22/59/59	0/3/3/3
2	T83	B	501	-	-	2/2/2/2	0/2/2/2
3	U2F	A	502	-	-	12/22/59/59	0/3/3/3
2	T83	A	501	-	-	0/2/2/2	0/2/2/2

All (16) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	501	T83	OAB-CAL	11.57	1.45	1.21
2	B	501	T83	OAB-CAL	11.26	1.44	1.21
2	B	501	T83	CAD-CAE	6.82	1.46	1.34
2	A	501	T83	CAD-CAE	6.25	1.45	1.34
2	B	501	T83	CAF-CAN	5.10	1.48	1.38
2	A	501	T83	CAF-CAN	4.79	1.47	1.38
2	A	501	T83	CAG-CAK	4.49	1.47	1.38
2	B	501	T83	CAG-CAK	4.48	1.47	1.38
2	B	501	T83	OAI-CAL	-3.14	1.32	1.38
2	A	501	T83	OAI-CAL	-3.00	1.33	1.38
2	A	501	T83	OAC-CAJ	2.70	1.41	1.36
2	B	501	T83	CAF-CAJ	2.51	1.42	1.38
2	A	501	T83	CAF-CAJ	2.49	1.42	1.38
2	A	501	T83	OAH-CAK	2.41	1.41	1.37
2	B	501	T83	OAH-CAK	2.38	1.41	1.37
2	B	501	T83	OAC-CAJ	2.15	1.40	1.36

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	501	T83	OAB-CAL-CAD	-5.23	116.28	126.00
2	B	501	T83	OAB-CAL-CAD	-4.26	118.09	126.00
2	A	501	T83	OAI-CAL-OAB	4.23	121.83	116.44
2	A	501	T83	OAH-CAK-CAJ	4.22	120.69	114.57
2	B	501	T83	OAH-CAK-CAJ	4.14	120.57	114.57
2	B	501	T83	CAM-CAE-CAD	-3.34	116.96	121.54
3	A	502	U2F	PA-O3A-PB	3.29	144.13	132.83
2	B	501	T83	OAI-CAL-CAD	3.29	122.13	117.12
2	A	501	T83	OAI-CAL-CAD	3.13	121.89	117.12
2	B	501	T83	OAI-CAL-OAB	2.62	119.78	116.44
2	A	501	T83	OAH-CAK-CAG	-2.61	119.62	124.12
2	A	501	T83	CAM-CAE-CAD	-2.59	117.99	121.54
3	A	502	U2F	O2B-PB-O1B	2.46	124.38	112.24
2	A	501	T83	CAE-CAD-CAL	-2.41	118.31	121.43
2	A	501	T83	CAA-OAH-CAK	2.35	121.07	117.53
2	B	501	T83	OAH-CAK-CAG	-2.29	120.18	124.12

There are no chirality outliers.

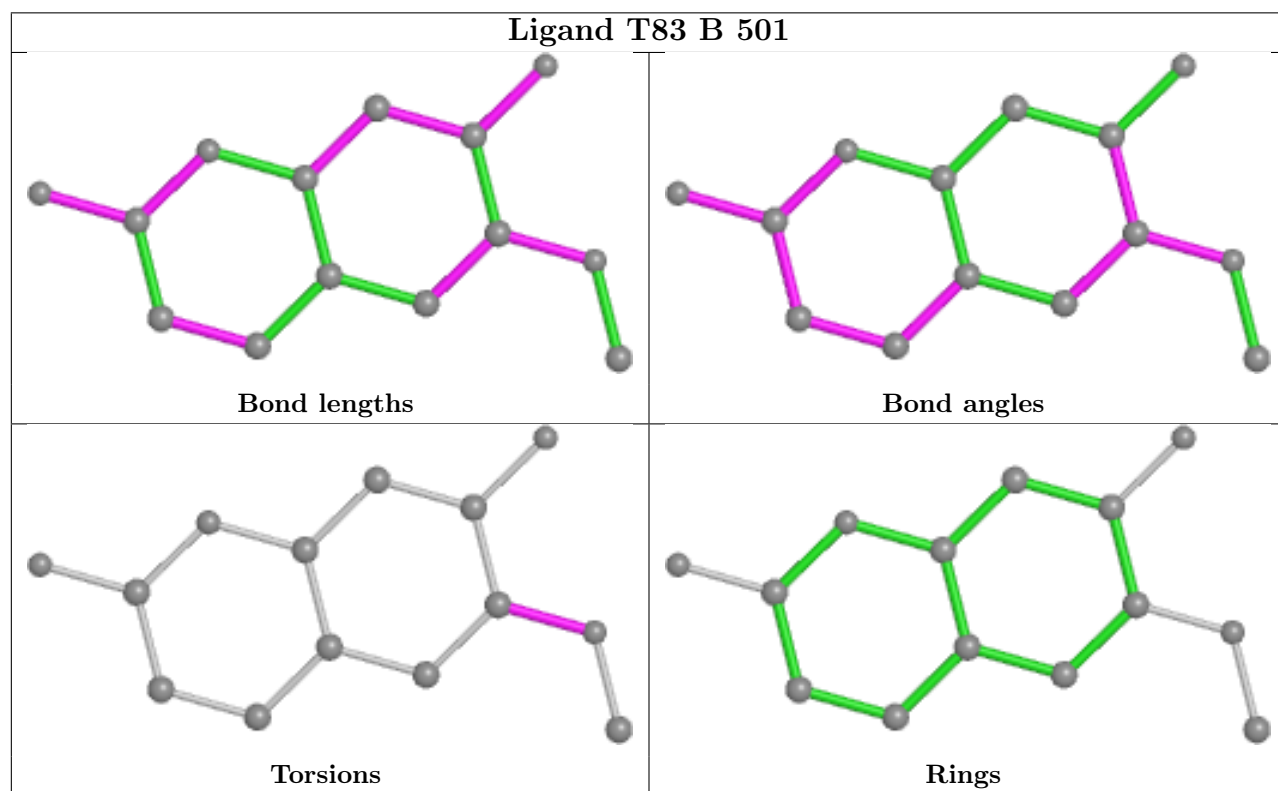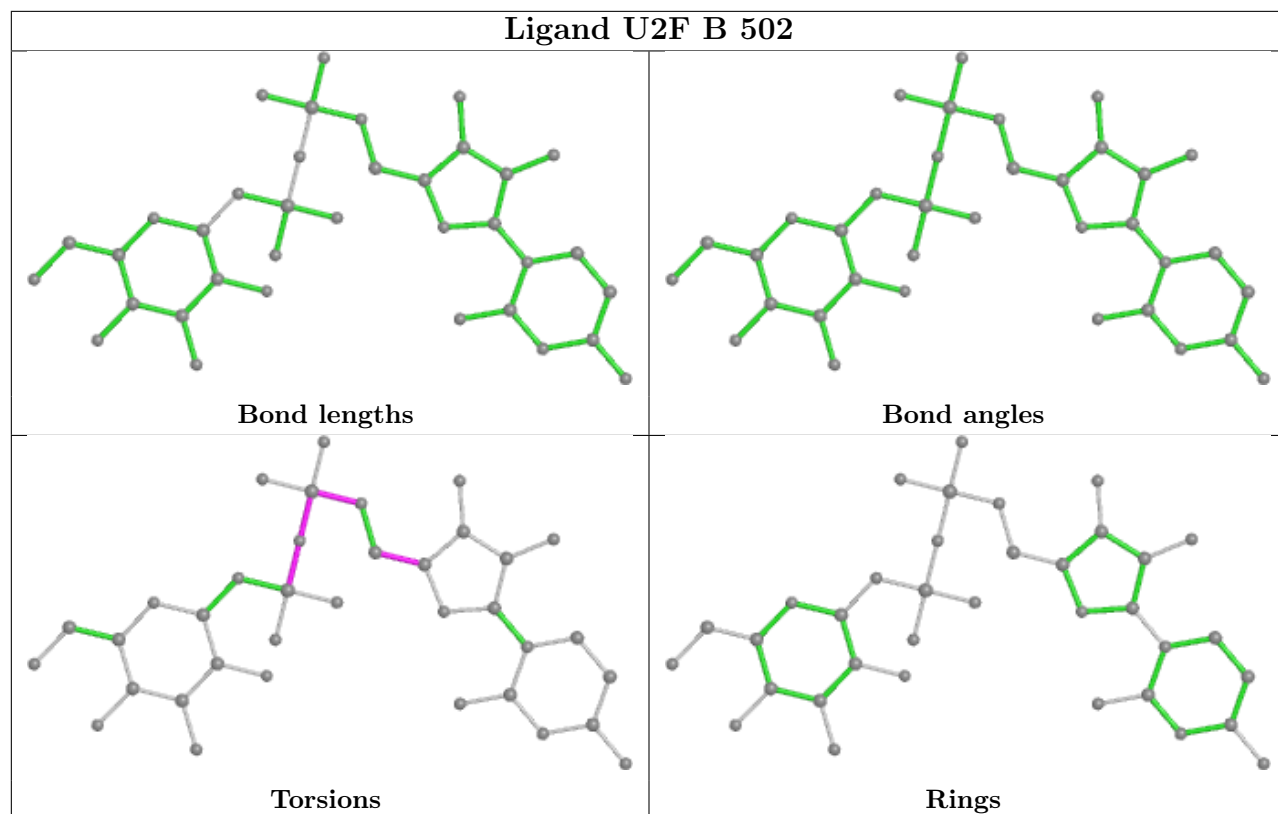All (20) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	502	U2F	C5'-O5'-PA-O3A
3	A	502	U2F	C5'-O5'-PA-O1A
3	B	502	U2F	C5'-O5'-PA-O3A
3	A	502	U2F	O4'-C4'-C5'-O5'
2	B	501	T83	CAG-CAK-OAH-CAA
3	A	502	U2F	O5-C5-C6-O6
3	A	502	U2F	C4-C5-C6-O6
2	B	501	T83	CAJ-CAK-OAH-CAA
3	B	502	U2F	O4'-C4'-C5'-O5'
3	A	502	U2F	C1-O1-PB-O3A
3	A	502	U2F	C3'-C4'-C5'-O5'
3	A	502	U2F	PA-O3A-PB-O1
3	B	502	U2F	PA-O3A-PB-O1
3	B	502	U2F	PB-O3A-PA-O1A
3	A	502	U2F	C5'-O5'-PA-O2A
3	B	502	U2F	C5'-O5'-PA-O1A
3	B	502	U2F	C5'-O5'-PA-O2A
3	A	502	U2F	C4'-C5'-O5'-PA
3	A	502	U2F	PA-O3A-PB-O1B
3	A	502	U2F	PB-O3A-PA-O1A

There are no ring outliers.

2 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	502	U2F	1	0
3	A	502	U2F	3	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 U2F B 502

Bond lengths

Bond angles

Torsions

Rings

Ligand T83 B 501

Bond lengths

Bond angles

Torsions

Rings

Ligand U2F A 502

Bond lengths

Bond angles

Torsions

Rings

Ligand T83 A 501

Bond lengths

Bond angles

Torsions

Rings
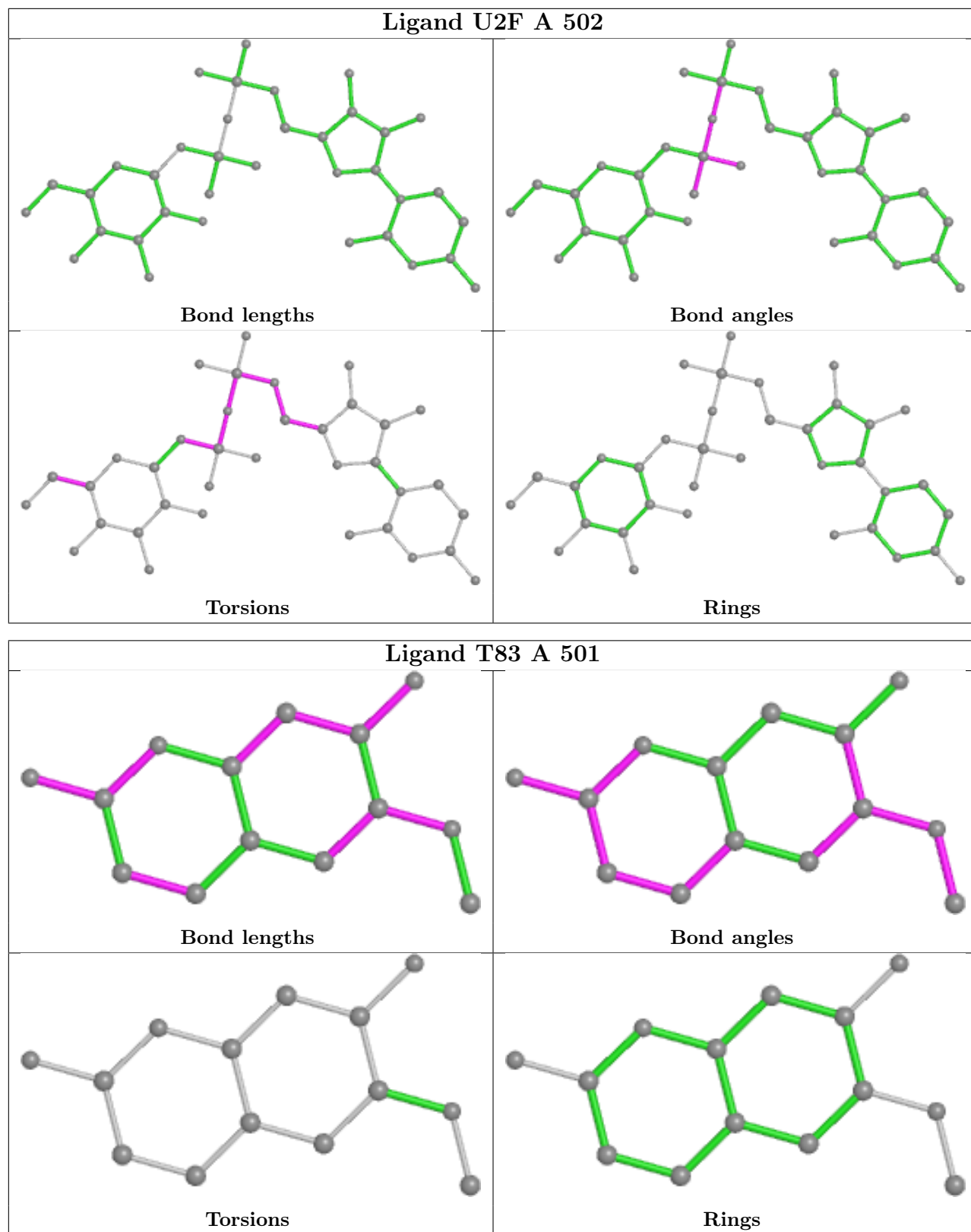
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues (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	475/475 (100%)	-0.36	0	100	100	37, 66, 112, 174	0
1	B	463/475 (97%)	-0.23	0	100	100	45, 81, 141, 194	0
All	All	938/950 (98%)	-0.29	0	100	100	37, 73, 132, 194	0

There are no RSRZ outliers to report.

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	0.84	0.16	75,88,109,110	0
2	T83	A	501	14/14	0.85	0.22	83,95,107,110	0
3	U2F	B	502	36/36	0.93	0.12	46,70,198,219	0
3	U2F	A	502	36/36	0.96	0.09	33,60,107,110	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.
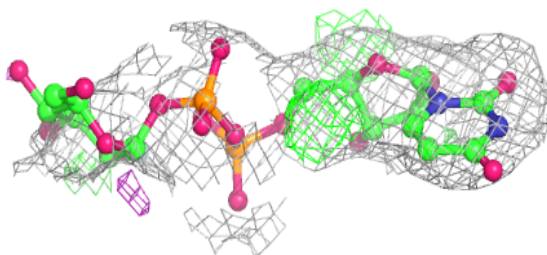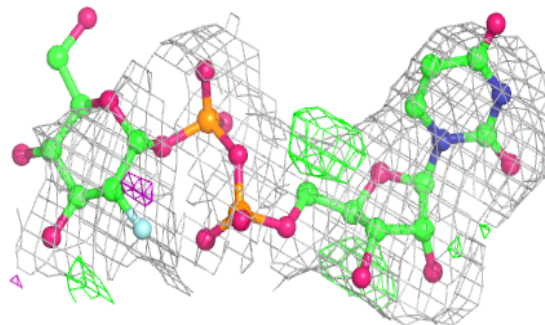
Electron density around T83 B 501:

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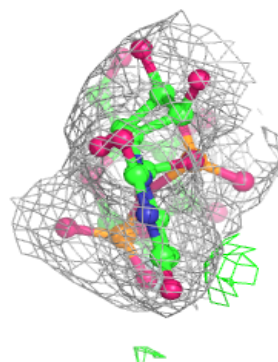$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
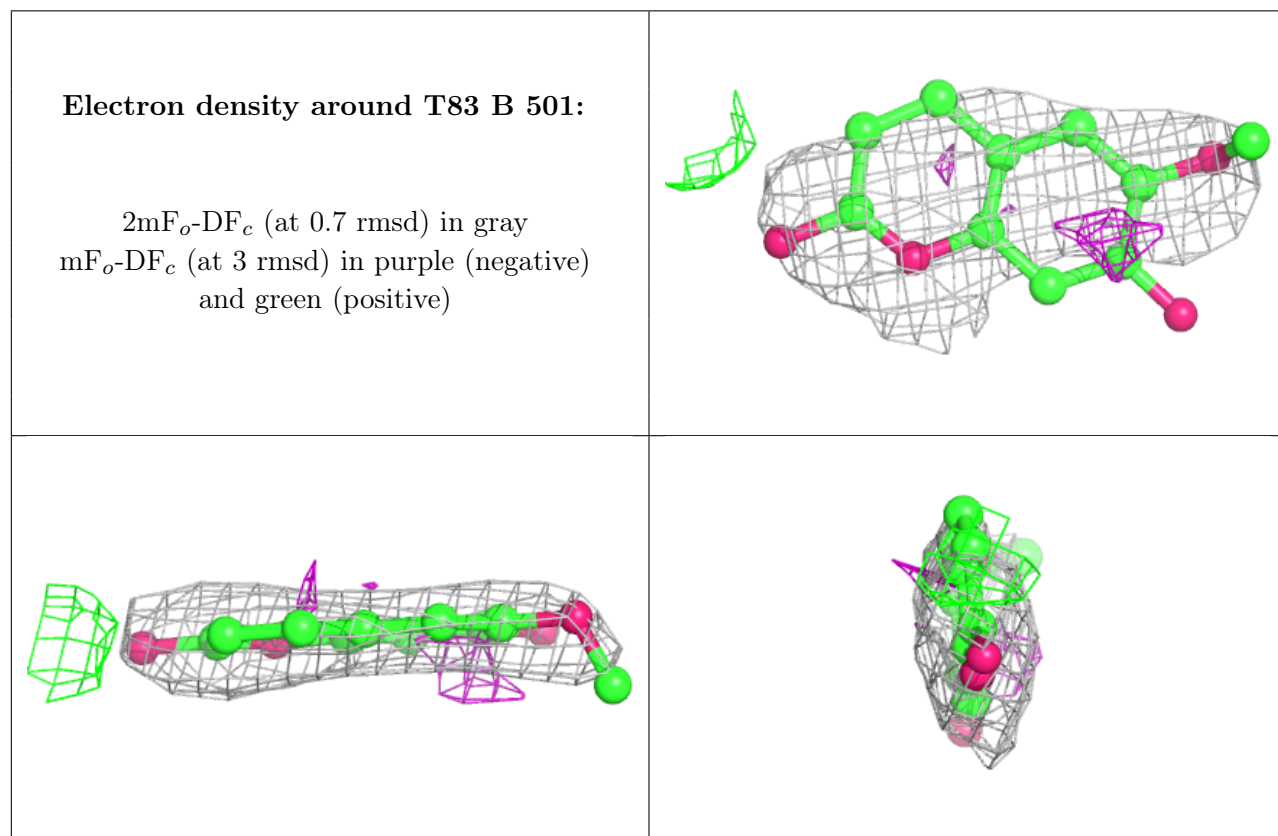
Electron density around T83 A 501:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
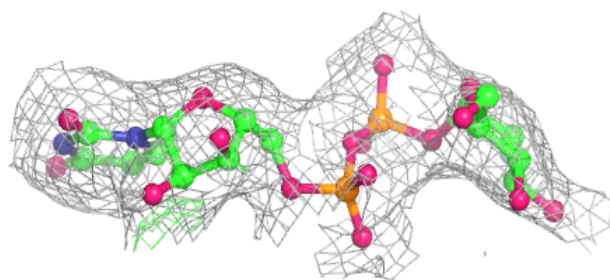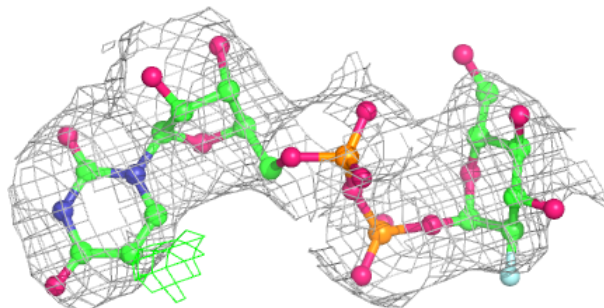and green (positive)
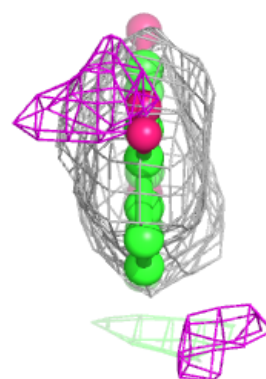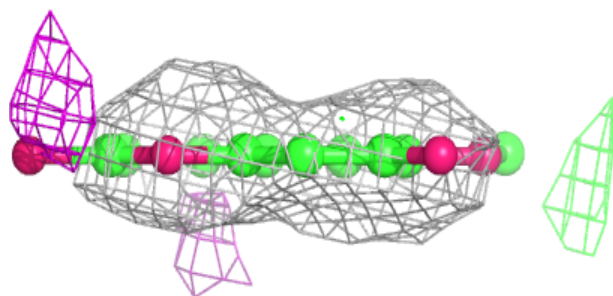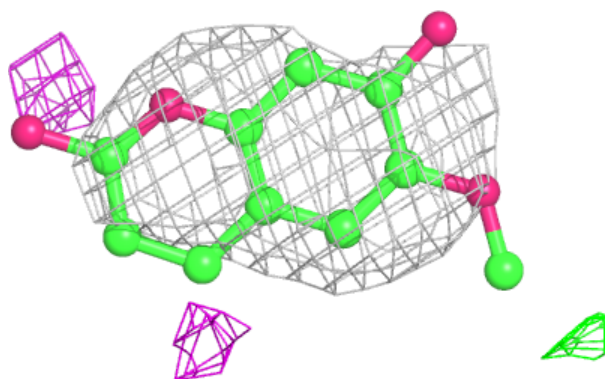
Electron density around U2F B 502:

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

Electron density around U2F 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.