



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 7, 2026 – 03:19 AM UTC

PDB ID : 2J4L / pdb_00002j4l
Title : Crystal structure of uridylylate kinase from *Sulfolobus solfataricus* in complex with UTP to 2.8 Angstrom resolution
Authors : Jensen, K.S.; Johansson, E.; Jensen, K.F.
Deposited on : 2006-09-01
Resolution : 2.80 Å(reported)

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

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	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

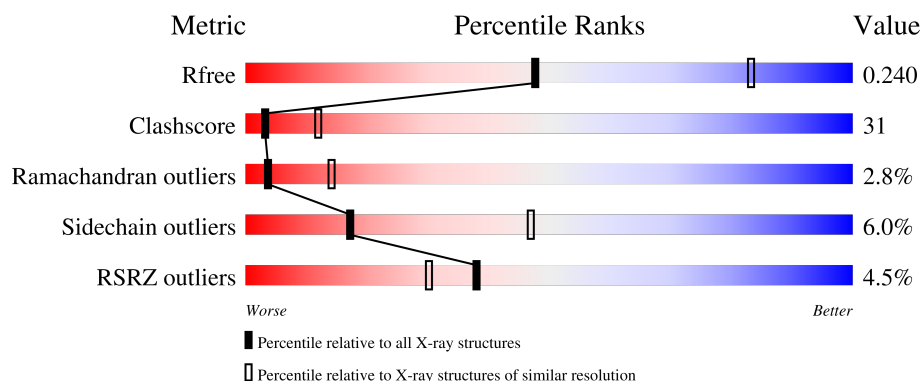
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 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	3866 (2.80-2.80)
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (2.80-2.80)
RSRZ outliers	180081	3869 (2.80-2.80)

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	226	5% 45% 39% 8% 5%
1	B	226	4% 46% 42% 7% 6%
1	C	226	5% 41% 37% 9% 12%
1	D	226	2% 47% 38% 9% 6%
1	E	226	3% 46% 45% ...

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Mol	Chain	Length	Quality of chain
1	F	226	4% 48% 42% 6% 2%
1	G	226	5% 42% 44% 6% 6%
1	H	226	7% 36% 35% 2% 24%
1	I	226	5% 44% 35% 7% 14%
1	J	226	3% 45% 43% 6% 5%
1	K	226	5% 40% 38% 6% 16%
1	L	226	2% 48% 42% 6% 5%

2 Entry composition

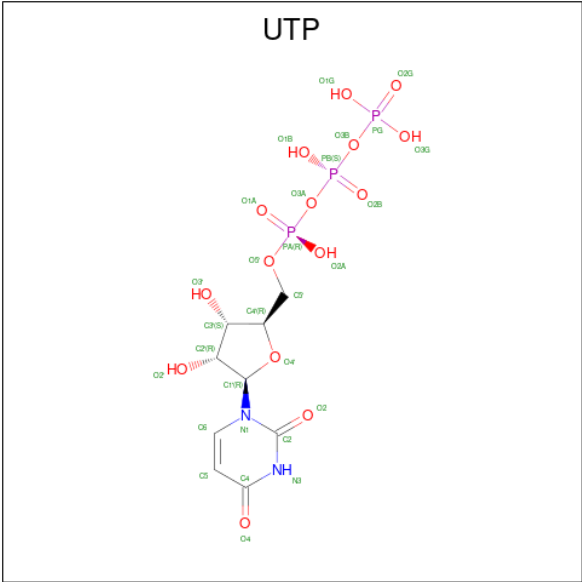
There are 3 unique types of molecules in this entry. The entry contains 19613 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 URIDYLATE KINASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	214	Total	C	N	O	S	0	0	0
			1674	1074	286	310	4			
1	B	213	Total	C	N	O	S	0	0	0
			1665	1069	285	307	4			
1	C	198	Total	C	N	O	S	0	0	0
			1539	991	260	284	4			
1	D	213	Total	C	N	O	S	0	0	0
			1665	1069	285	307	4			
1	E	217	Total	C	N	O	S	0	0	0
			1688	1082	287	315	4			
1	F	219	Total	C	N	O	S	0	0	0
			1714	1100	291	319	4			
1	G	212	Total	C	N	O	S	0	0	0
			1662	1070	283	305	4			
1	H	171	Total	C	N	O	S	0	0	0
			1317	850	222	241	4			
1	I	194	Total	C	N	O	S	0	0	0
			1507	970	256	277	4			
1	J	214	Total	C	N	O	S	0	0	0
			1673	1075	286	308	4			
1	K	190	Total	C	N	O	S	0	0	0
			1481	950	254	273	4			
1	L	214	Total	C	N	O	S	0	0	0
			1673	1075	286	308	4			

- Molecule 2 is URIDINE 5'-TRIPHOSPHATE (CCD ID: UTP) (formula: $C_9H_{15}N_2O_{15}P_3$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			29	9	2	15	3		
2	B	1	Total	C	N	O	P	0	0
			29	9	2	15	3		
2	C	1	Total	C	N	O	P	0	0
			29	9	2	15	3		
2	D	1	Total	C	N	O	P	0	0
			29	9	2	15	3		
2	E	1	Total	C	N	O	P	0	0
			29	9	2	15	3		
2	F	1	Total	C	N	O	P	0	0
			29	9	2	15	3		
2	G	1	Total	C	N	O	P	0	0
			29	9	2	15	3		
2	H	1	Total	C	N	O	P	0	0
			29	9	2	15	3		
2	I	1	Total	C	N	O	P	0	0
			29	9	2	15	3		
2	J	1	Total	C	N	O	P	0	0
			29	9	2	15	3		
2	K	1	Total	C	N	O	P	0	0
			29	9	2	15	3		
2	L	1	Total	C	N	O	P	0	0
			29	9	2	15	3		

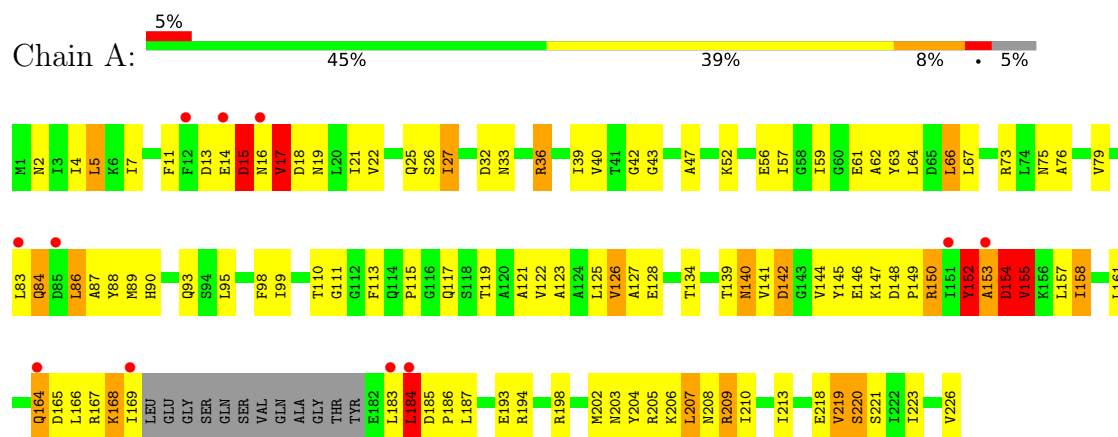
- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

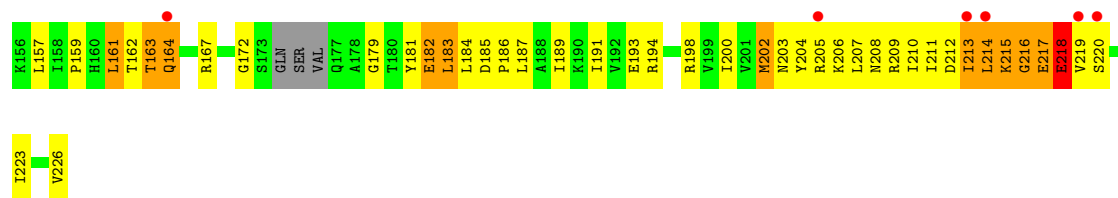
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	1	Total 1	Mg 1	0	0
3	C	1	Total 1	Mg 1	0	0
3	D	1	Total 1	Mg 1	0	0
3	E	1	Total 1	Mg 1	0	0
3	I	1	Total 1	Mg 1	0	0
3	J	1	Total 1	Mg 1	0	0
3	L	1	Total 1	Mg 1	0	0

3 Residue-property plots [i](#)

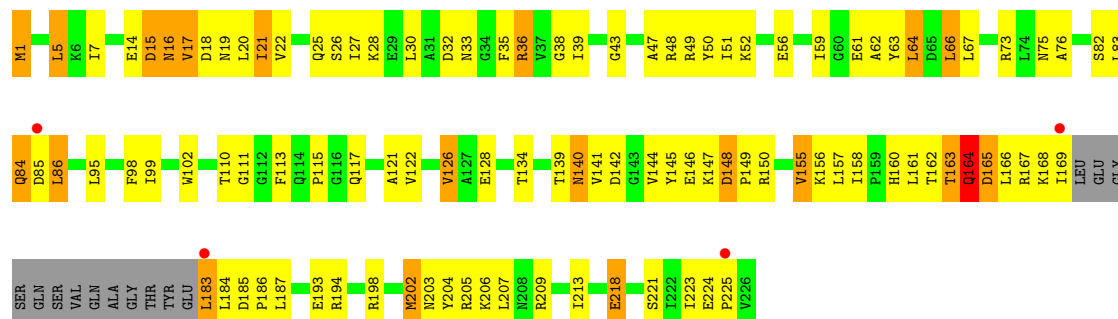
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: URIDYLATE KINASE

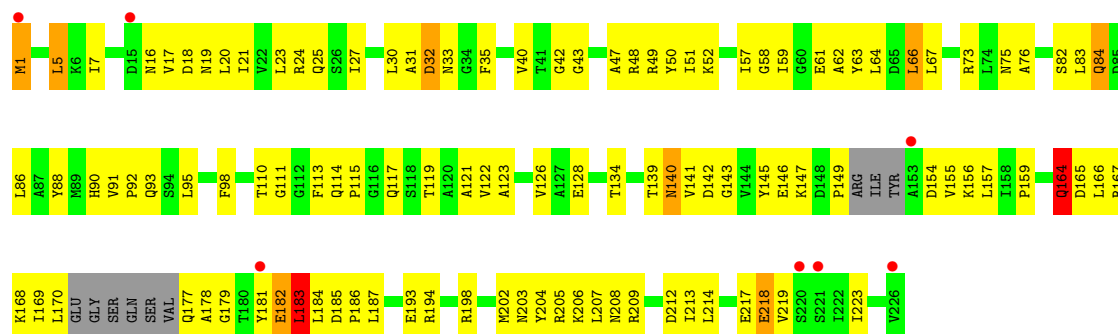




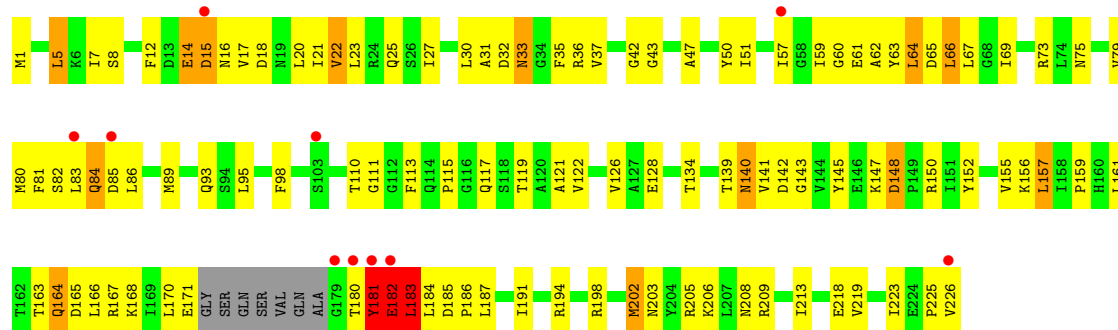
• Molecule 1: URIDYLATE KINASE



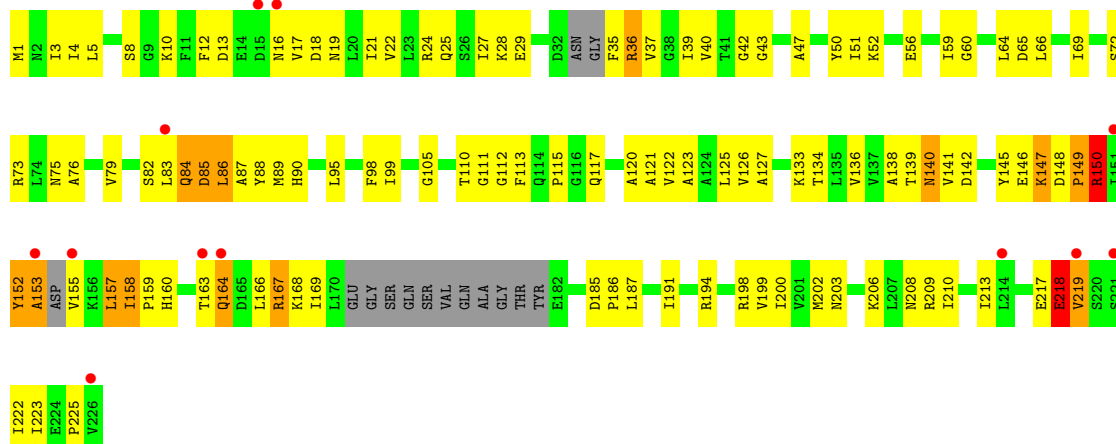
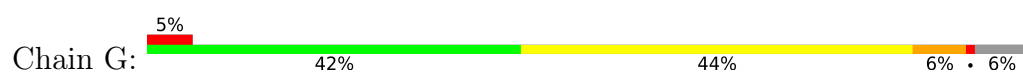
• Molecule 1: URIDYLATE KINASE



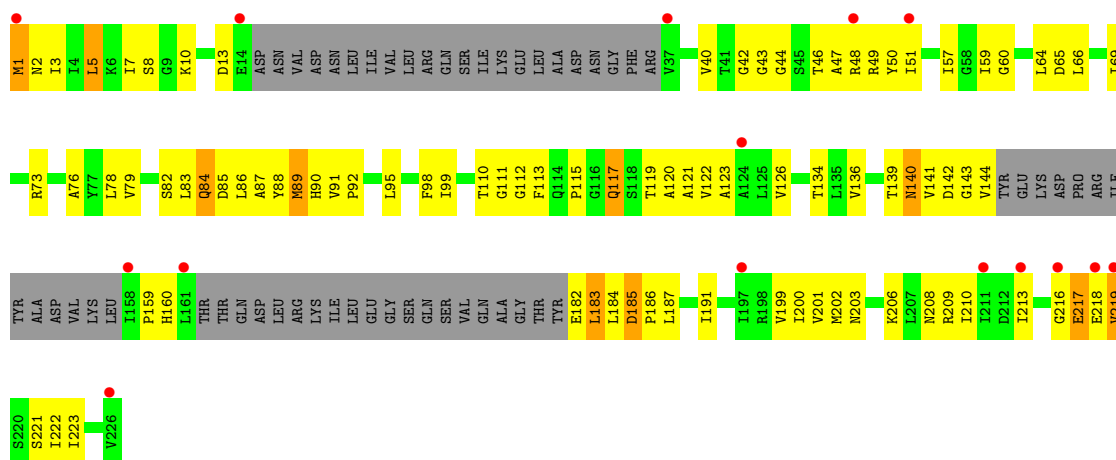
• Molecule 1: URIDYLATE KINASE



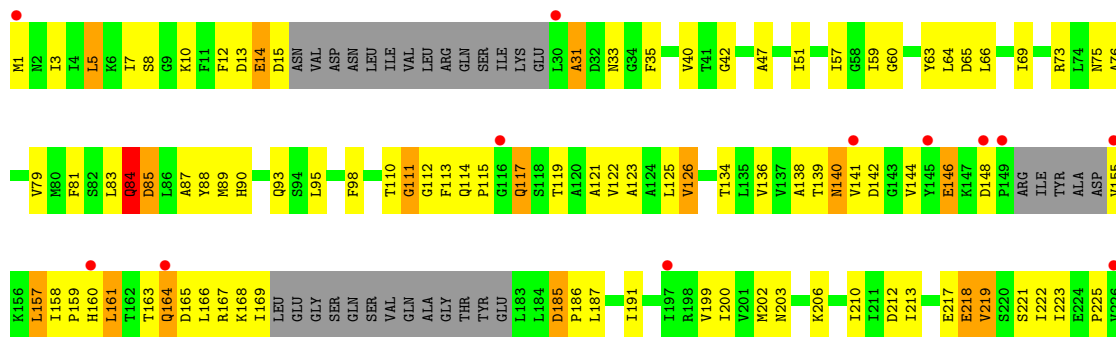
• Molecule 1: URIDYLATE KINASE



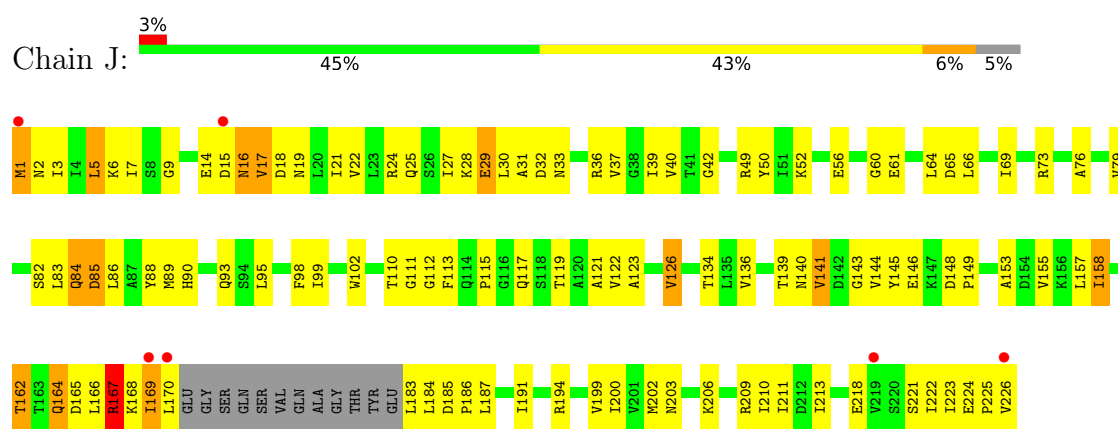
• Molecule 1: URIDYLATE KINASE



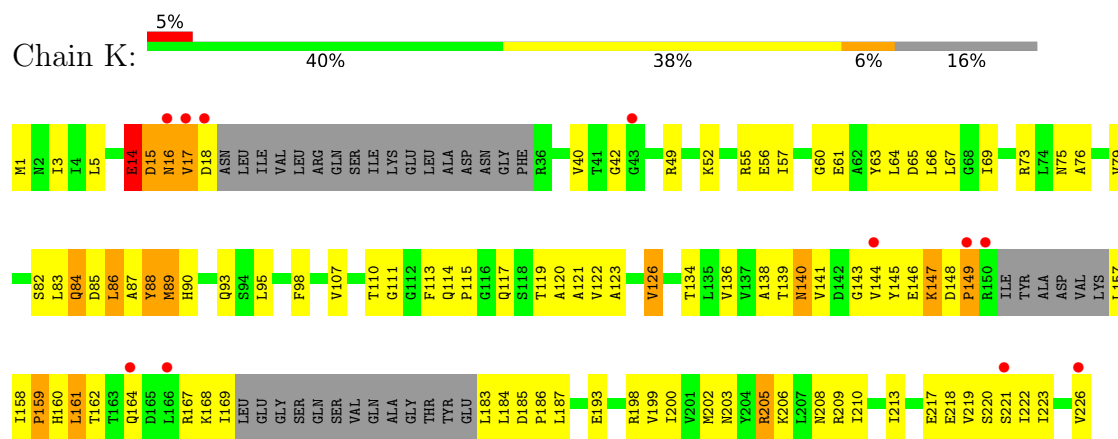
• Molecule 1: URIDYLATE KINASE



• Molecule 1: URIDYLATE KINASE



• Molecule 1: URIDYLATE KINASE



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	224.75Å 79.03Å 223.47Å 90.00° 96.56° 90.00°	Depositor
Resolution (Å)	29.63 – 2.80 29.63 – 2.80	Depositor EDS
% Data completeness (in resolution range)	94.6 (29.63-2.80) 94.6 (29.63-2.80)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.19 (at 2.76Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.246 , 0.278 0.246 , 0.240	Depositor DCC
R_{free} test set	4633 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	74.1	Xtriage
Anisotropy	0.498	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 49.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	19613	wwPDB-VP
Average B, all atoms (Å ²)	76.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.52% 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: UTP, MG

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	0.65	0/1698	1.12	11/2296 (0.5%)
1	B	0.60	0/1689	1.04	12/2284 (0.5%)
1	C	0.69	5/1561 (0.3%)	1.19	13/2107 (0.6%)
1	D	0.55	0/1689	1.05	12/2284 (0.5%)
1	E	0.54	0/1711	1.03	7/2313 (0.3%)
1	F	0.66	2/1739 (0.1%)	1.13	10/2352 (0.4%)
1	G	0.64	4/1684 (0.2%)	1.61	18/2274 (0.8%)
1	H	0.43	0/1335	0.95	5/1803 (0.3%)
1	I	0.45	0/1528	1.00	5/2063 (0.2%)
1	J	0.50	0/1697	1.02	4/2295 (0.2%)
1	K	0.53	0/1501	1.03	10/2027 (0.5%)
1	L	0.56	0/1697	1.03	8/2295 (0.3%)
All	All	0.57	11/19529 (0.1%)	1.12	115/26393 (0.4%)

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	G	0	2

The worst 5 of 11 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	G	153	ALA	C-O	-11.95	1.07	1.24
1	G	152	TYR	C-N	-8.59	1.22	1.33
1	C	214	LEU	CA-C	-6.42	1.44	1.52
1	G	218	GLU	N-CA	5.98	1.53	1.46
1	F	182	GLU	C-N	-5.66	1.25	1.33

The worst 5 of 115 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	G	150	ARG	CA-C-N	23.56	148.47	121.84
1	G	150	ARG	C-N-CA	23.56	148.47	121.84
1	G	150	ARG	O-C-N	-22.20	93.06	122.59
1	G	153	ALA	CA-C-O	-21.42	94.50	119.56
1	G	152	TYR	CA-C-N	-20.59	89.70	122.65

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	G	150	ARG	Mainchain
1	G	152	TYR	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	1674	0	1742	114	0
1	B	1665	0	1736	105	0
1	C	1539	0	1599	104	0
1	D	1665	0	1736	104	0
1	E	1688	0	1751	121	0
1	F	1714	0	1778	127	0
1	G	1662	0	1738	116	0
1	H	1317	0	1374	96	0
1	I	1507	0	1569	99	0
1	J	1673	0	1747	125	0
1	K	1481	0	1541	105	0
1	L	1673	0	1747	121	0
2	A	29	0	11	0	0
2	B	29	0	11	1	0
2	C	29	0	11	2	0
2	D	29	0	11	0	0
2	E	29	0	11	2	0
2	F	29	0	11	5	0
2	G	29	0	11	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	H	29	0	11	2	0
2	I	29	0	11	2	0
2	J	29	0	11	3	0
2	K	29	0	11	0	0
2	L	29	0	11	1	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
3	E	1	0	0	0	0
3	I	1	0	0	0	0
3	J	1	0	0	0	0
3	L	1	0	0	0	0
All	All	19613	0	20190	1224	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 31.

The worst 5 of 1224 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:C:212:ASP:O	1:C:216:GLY:N	1.83	1.12
1:B:14:GLU:HB3	1:B:16:ASN:HD22	1.05	1.10
1:D:156:LYS:HG3	1:D:157:LEU:H	1.16	1.05
1:D:145:TYR:HD1	1:D:156:LYS:O	1.43	1.02
1:I:212:ASP:HB3	1:I:217:GLU:HB2	1.42	1.00

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	210/226 (93%)	190 (90%)	11 (5%)	9 (4%)	2	7
1	B	209/226 (92%)	198 (95%)	7 (3%)	4 (2%)	6	22
1	C	190/226 (84%)	166 (87%)	20 (10%)	4 (2%)	5	20
1	D	209/226 (92%)	191 (91%)	12 (6%)	6 (3%)	3	13
1	E	211/226 (93%)	187 (89%)	21 (10%)	3 (1%)	9	30
1	F	215/226 (95%)	192 (89%)	17 (8%)	6 (3%)	4	14
1	G	204/226 (90%)	182 (89%)	18 (9%)	4 (2%)	6	21
1	H	163/226 (72%)	147 (90%)	10 (6%)	6 (4%)	2	9
1	I	186/226 (82%)	169 (91%)	11 (6%)	6 (3%)	3	11
1	J	210/226 (93%)	187 (89%)	17 (8%)	6 (3%)	3	13
1	K	182/226 (80%)	159 (87%)	13 (7%)	10 (6%)	1	4
1	L	210/226 (93%)	194 (92%)	13 (6%)	3 (1%)	9	30
All	All	2399/2712 (88%)	2162 (90%)	170 (7%)	67 (3%)	4	14

5 of 67 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	E	84	GLN
1	G	218	GLU
1	H	183	LEU
1	I	84	GLN
1	J	84	GLN

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	183/192 (95%)	167 (91%)	16 (9%)	9	30
1	B	182/192 (95%)	173 (95%)	9 (5%)	22	55
1	C	167/192 (87%)	153 (92%)	14 (8%)	10	32
1	D	182/192 (95%)	171 (94%)	11 (6%)	17	47

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	E	184/192 (96%)	174 (95%)	10 (5%)	20	51
1	F	187/192 (97%)	174 (93%)	13 (7%)	14	40
1	G	182/192 (95%)	170 (93%)	12 (7%)	15	43
1	H	143/192 (74%)	138 (96%)	5 (4%)	32	67
1	I	164/192 (85%)	155 (94%)	9 (6%)	19	51
1	J	183/192 (95%)	171 (93%)	12 (7%)	15	43
1	K	162/192 (84%)	156 (96%)	6 (4%)	30	65
1	L	183/192 (95%)	174 (95%)	9 (5%)	22	55
All	All	2102/2304 (91%)	1976 (94%)	126 (6%)	17	47

5 of 126 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	164	GLN
1	J	170	LEU
1	F	183	LEU
1	J	169	ILE
1	L	19	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 69 such sidechains are listed below:

Mol	Chain	Res	Type
1	J	164	GLN
1	K	84	GLN
1	L	84	GLN
1	D	117	GLN
1	D	114	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 [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 19 ligands modelled in this entry, 7 are monoatomic - leaving 12 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	UTP	F	1227	-	29,30,30	1.11	3 (10%)	43,47,47	1.01	3 (6%)
2	UTP	C	1227	3	29,30,30	1.30	5 (17%)	43,47,47	0.97	2 (4%)
2	UTP	E	1227	3	29,30,30	1.20	5 (17%)	43,47,47	0.99	3 (6%)
2	UTP	G	1227	-	29,30,30	1.35	3 (10%)	43,47,47	1.00	3 (6%)
2	UTP	B	1227	3	29,30,30	1.11	2 (6%)	43,47,47	1.06	3 (6%)
2	UTP	J	1227	3	29,30,30	1.62	3 (10%)	43,47,47	1.10	3 (6%)
2	UTP	D	1227	3	29,30,30	1.03	1 (3%)	43,47,47	1.03	3 (6%)
2	UTP	H	1227	-	29,30,30	1.48	2 (6%)	43,47,47	0.99	3 (6%)
2	UTP	I	1227	-	29,30,30	1.07	2 (6%)	43,47,47	1.00	3 (6%)
2	UTP	A	1227	-	29,30,30	1.36	3 (10%)	43,47,47	1.04	3 (6%)
2	UTP	K	1227	-	29,30,30	1.17	3 (10%)	43,47,47	1.01	3 (6%)
2	UTP	L	1227	3	29,30,30	1.00	3 (10%)	43,47,47	1.00	2 (4%)

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	UTP	F	1227	-	-	2/22/38/38	0/2/2/2
2	UTP	C	1227	3	-	2/22/38/38	0/2/2/2
2	UTP	E	1227	3	-	0/22/38/38	0/2/2/2
2	UTP	G	1227	-	-	6/22/38/38	0/2/2/2

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	UTP	B	1227	3	-	5/22/38/38	0/2/2/2
2	UTP	J	1227	3	-	3/22/38/38	0/2/2/2
2	UTP	D	1227	3	-	3/22/38/38	0/2/2/2
2	UTP	H	1227	-	-	0/22/38/38	0/2/2/2
2	UTP	I	1227	-	-	2/22/38/38	0/2/2/2
2	UTP	A	1227	-	-	2/22/38/38	0/2/2/2
2	UTP	K	1227	-	-	2/22/38/38	0/2/2/2
2	UTP	L	1227	3	-	2/22/38/38	0/2/2/2

The worst 5 of 35 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	H	1227	UTP	PA-O3A	5.17	1.65	1.59
2	G	1227	UTP	PA-O3A	4.83	1.64	1.59
2	J	1227	UTP	PA-O3A	4.23	1.64	1.59
2	A	1227	UTP	PB-O3B	4.16	1.64	1.59
2	J	1227	UTP	PB-O3B	4.11	1.63	1.59

The worst 5 of 34 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	J	1227	UTP	O1B-PB-O3A	3.63	117.09	107.27
2	D	1227	UTP	O1B-PB-O3A	3.37	116.39	107.27
2	H	1227	UTP	O1B-PB-O3A	3.35	116.33	107.27
2	B	1227	UTP	O1B-PB-O3A	3.29	116.17	107.27
2	G	1227	UTP	O1B-PB-O3A	3.24	116.03	107.27

There are no chirality outliers.

5 of 29 torsion outliers are listed below:

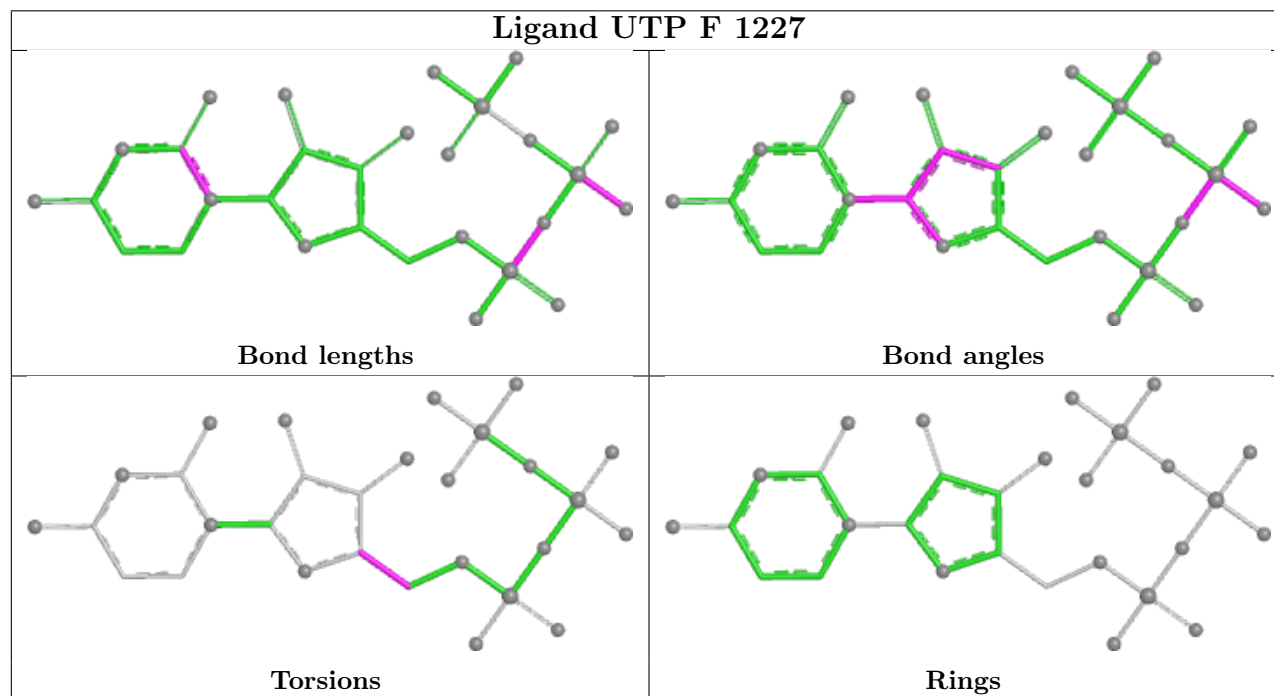
Mol	Chain	Res	Type	Atoms
2	D	1227	UTP	PB-O3B-PG-O1G
2	G	1227	UTP	PB-O3B-PG-O1G
2	B	1227	UTP	C3'-C4'-C5'-O5'
2	I	1227	UTP	C3'-C4'-C5'-O5'
2	B	1227	UTP	O4'-C4'-C5'-O5'

There are no ring outliers.

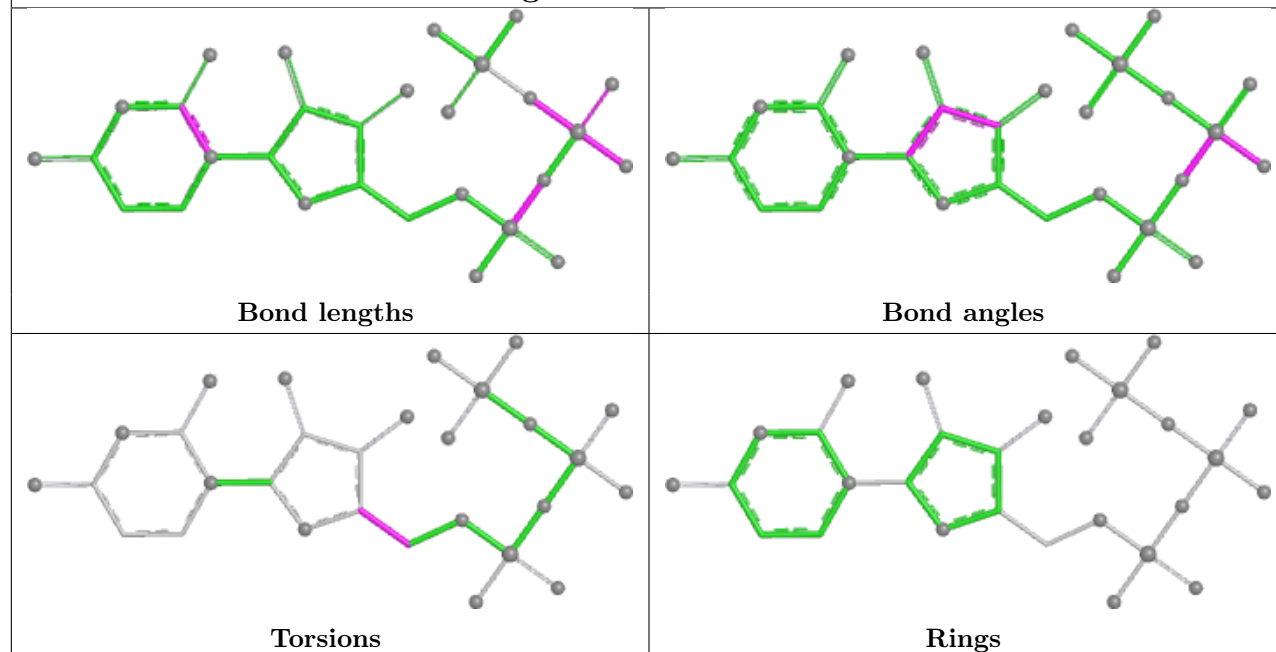
9 monomers are involved in 19 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	F	1227	UTP	5	0
2	C	1227	UTP	2	0
2	E	1227	UTP	2	0
2	G	1227	UTP	1	0
2	B	1227	UTP	1	0
2	J	1227	UTP	3	0
2	H	1227	UTP	2	0
2	I	1227	UTP	2	0
2	L	1227	UTP	1	0

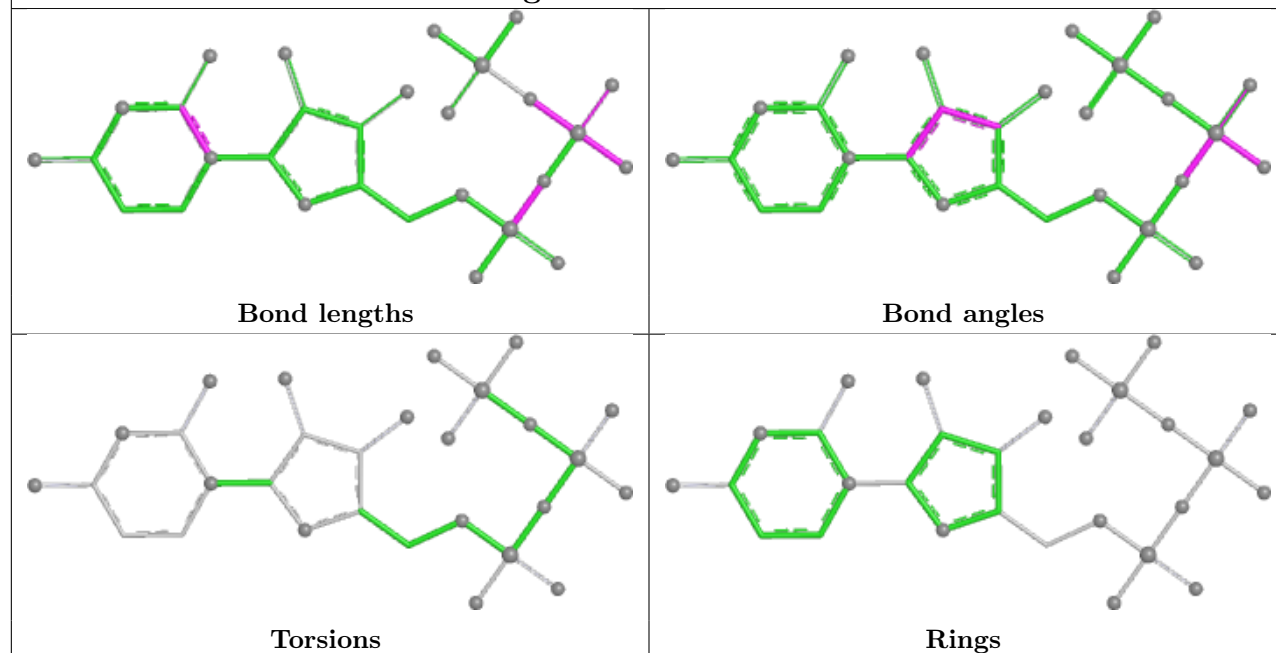
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



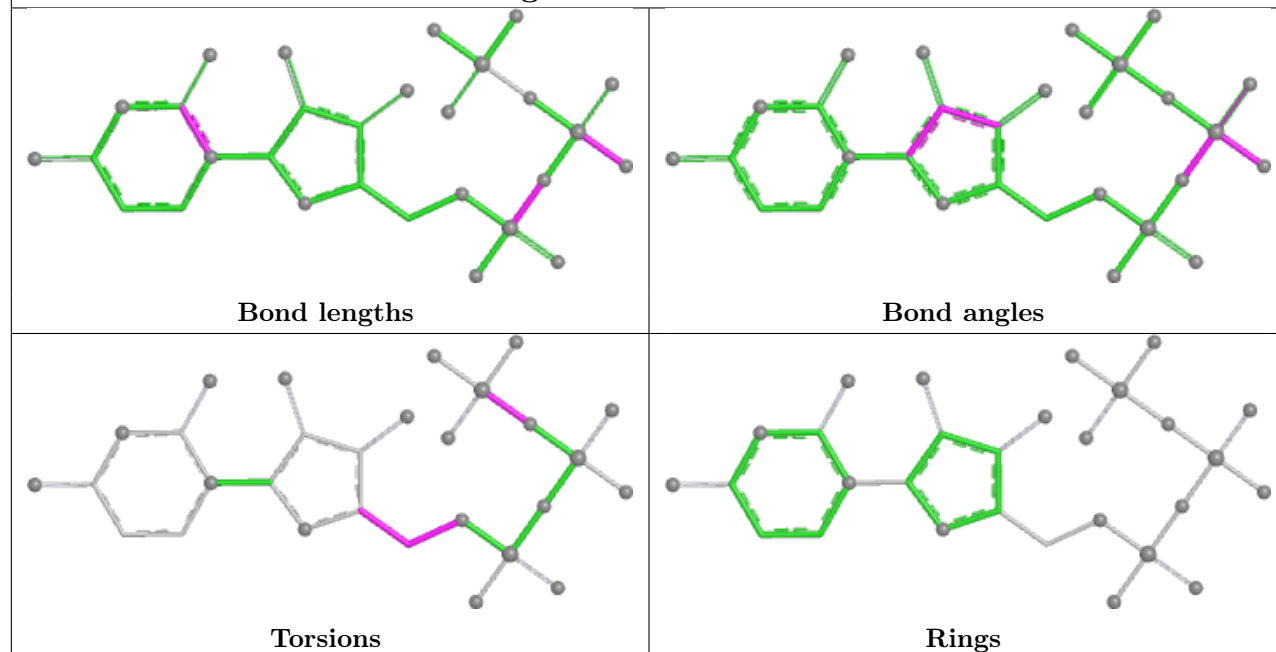
Ligand UTP C 1227



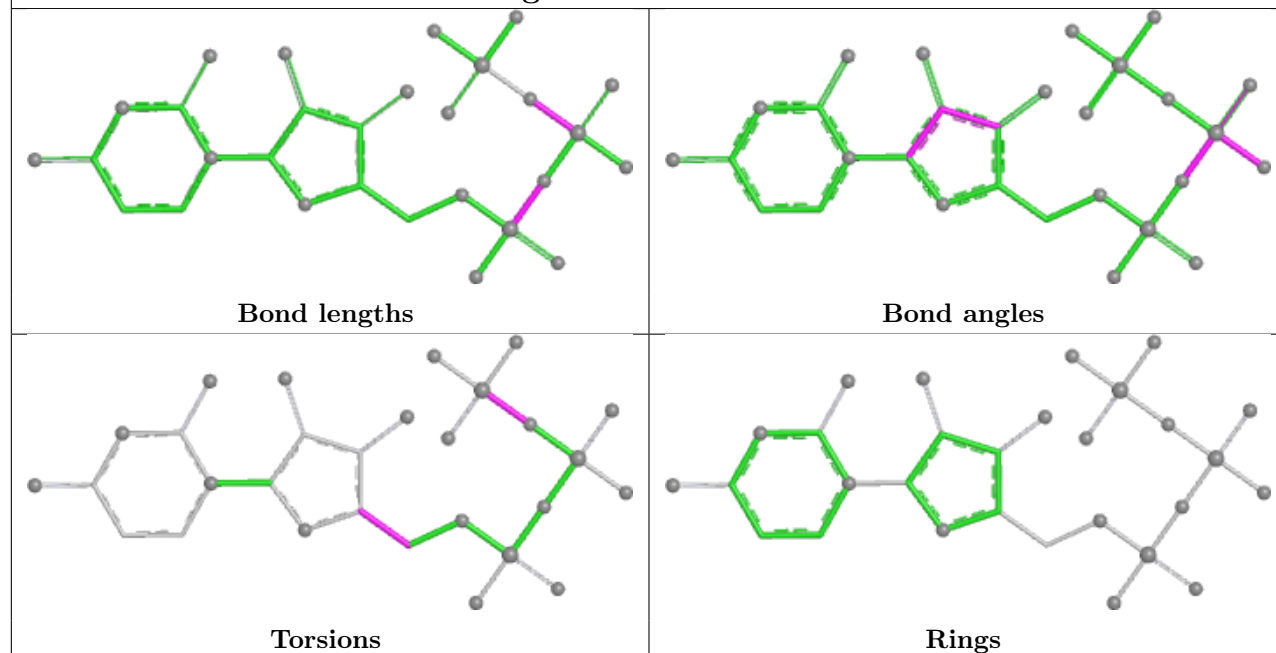
Ligand UTP E 1227

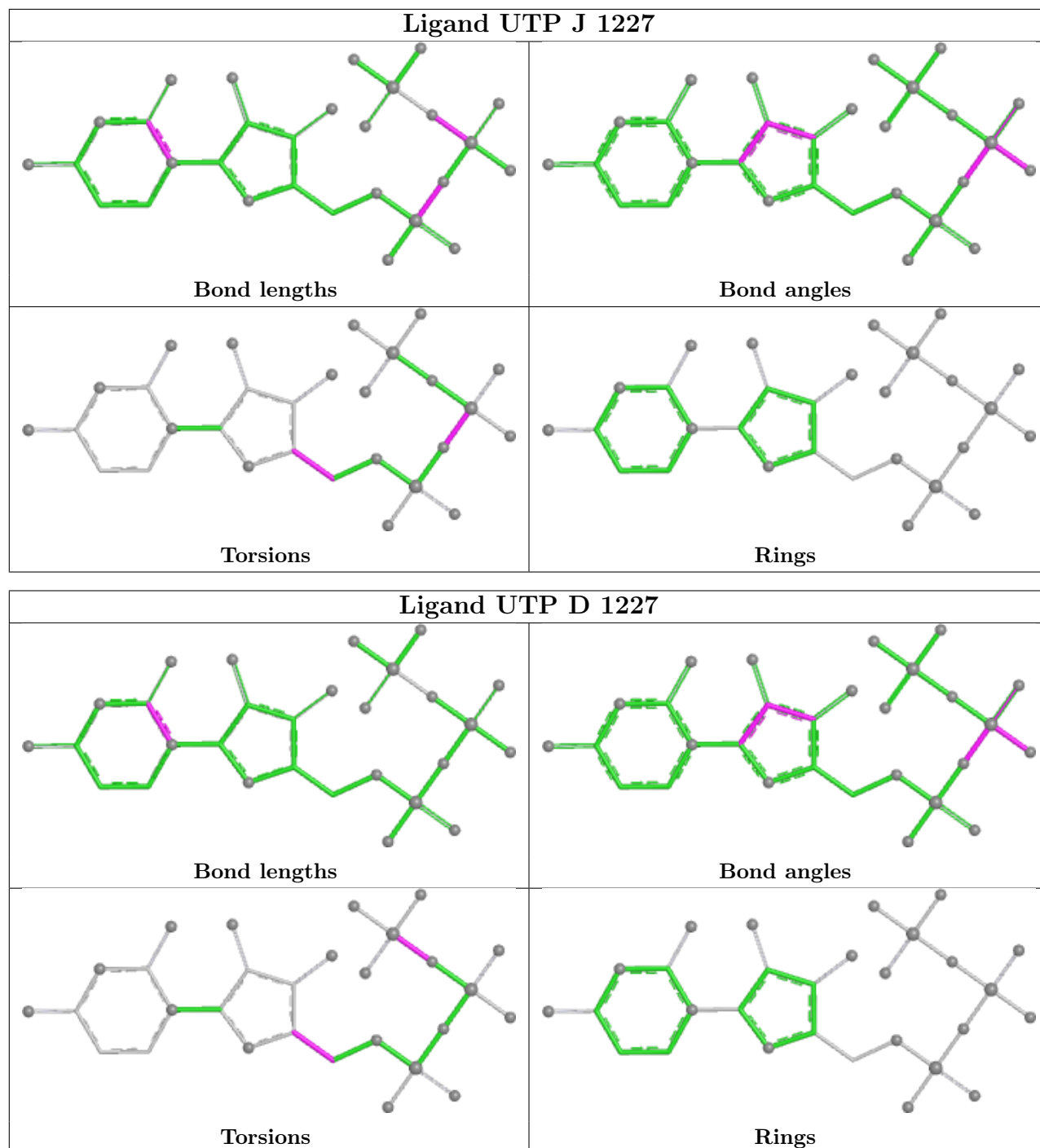


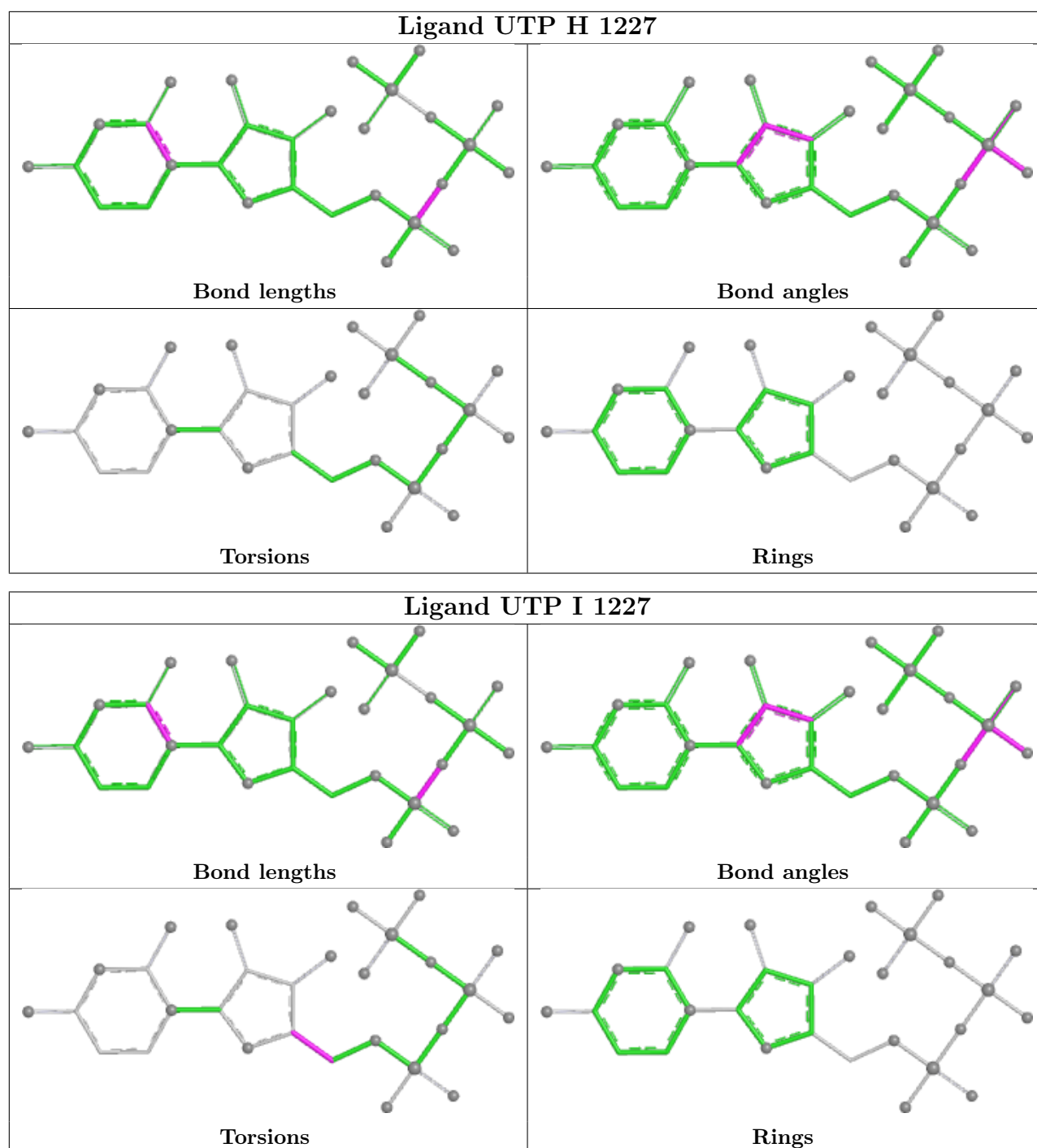
Ligand UTP G 1227



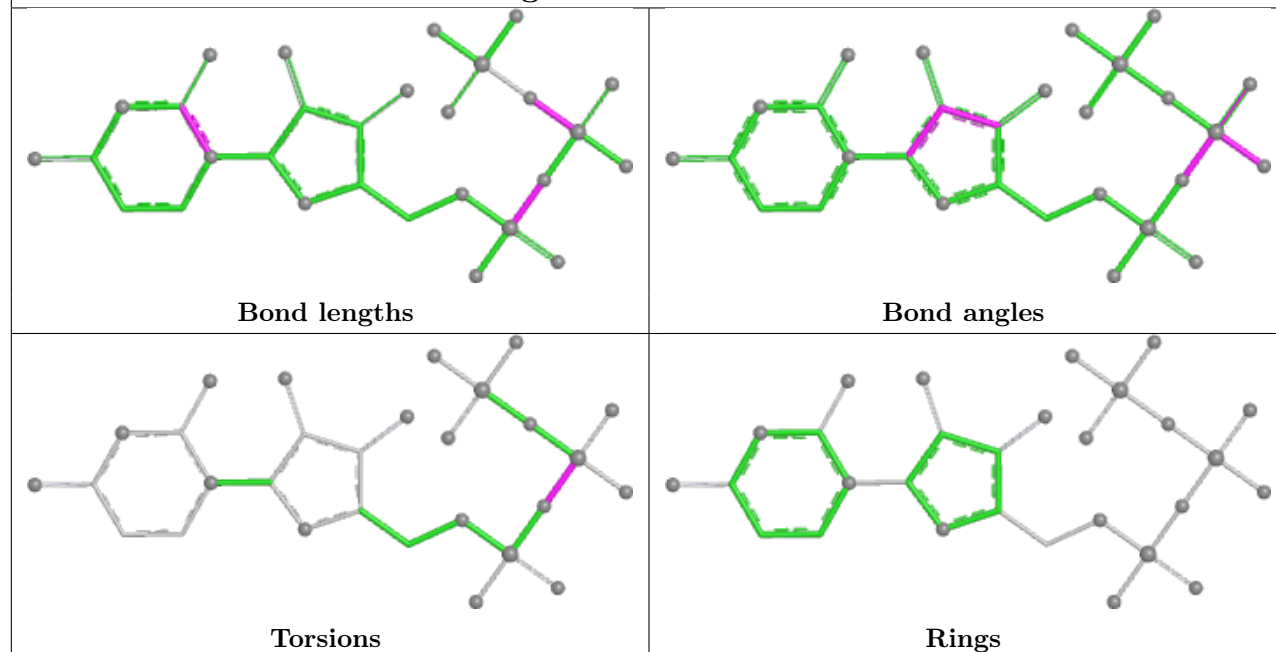
Ligand UTP B 1227



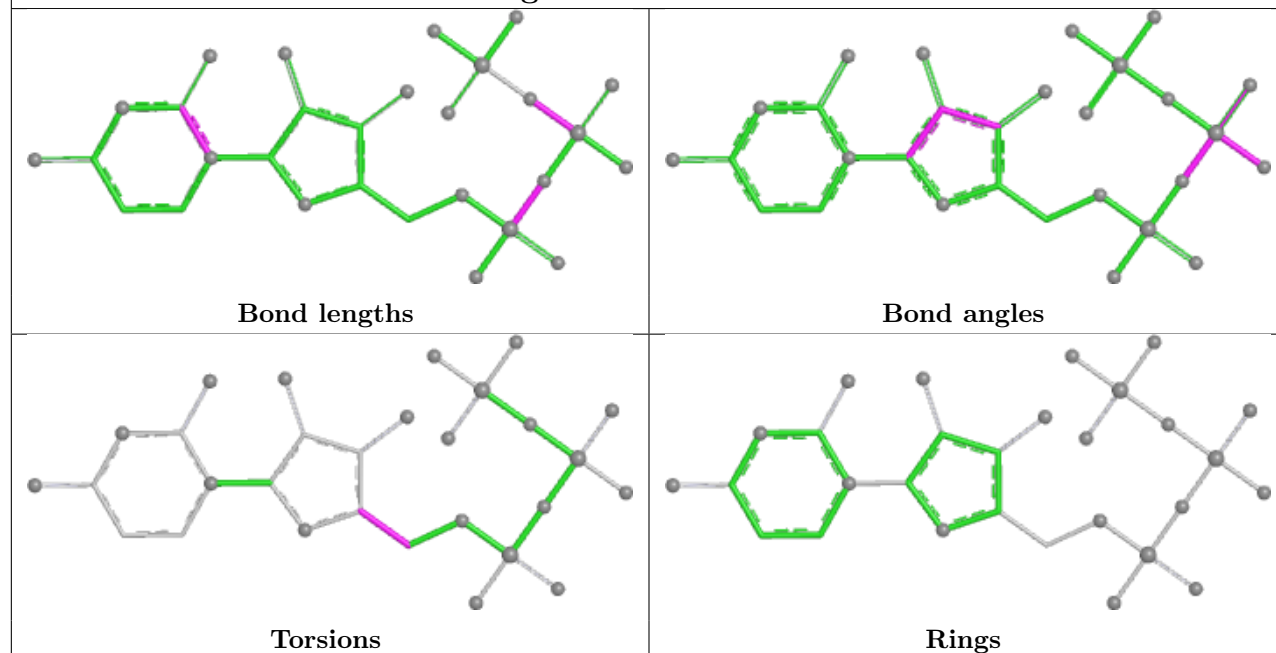


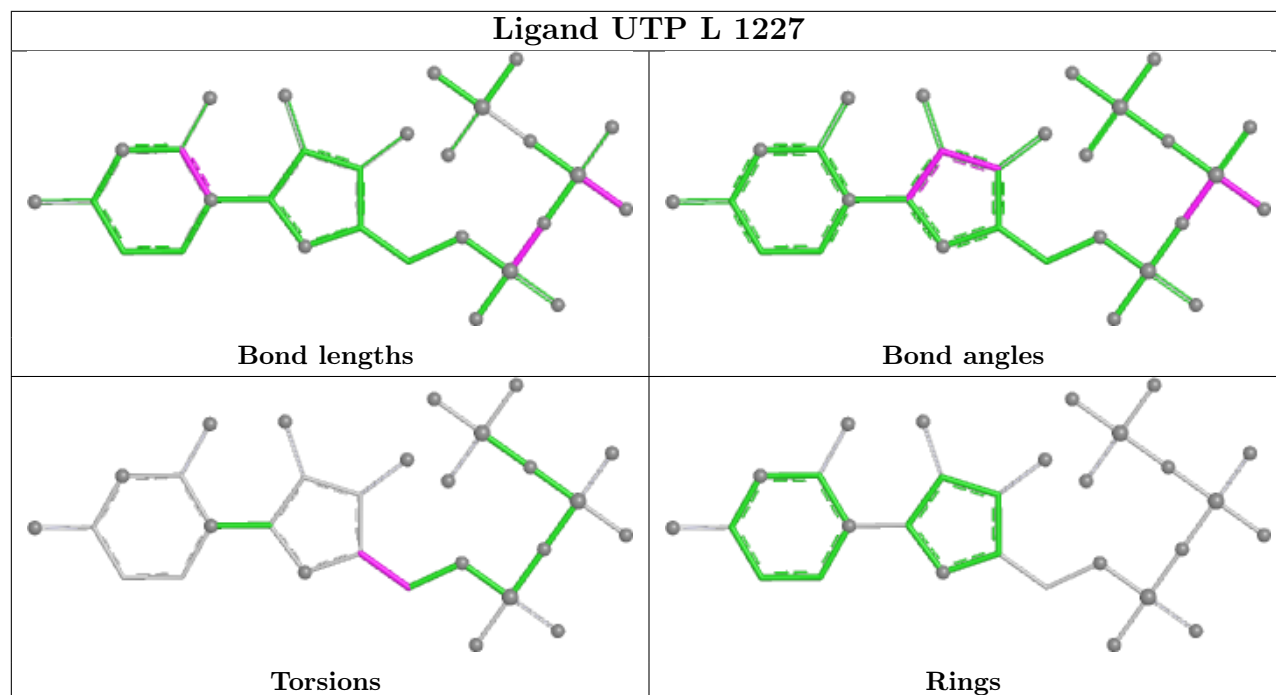


Ligand UTP A 1227



Ligand UTP K 1227





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ > 2	OWAB(Å ²)	Q < 0.9
1	A	214/226 (94%)	0.25	11 (5%) 33 25	39, 59, 107, 116	0
1	B	213/226 (94%)	0.16	9 (4%) 40 32	42, 62, 92, 101	0
1	C	198/226 (87%)	0.44	11 (5%) 30 23	40, 65, 110, 121	0
1	D	213/226 (94%)	0.18	4 (1%) 66 57	44, 67, 96, 109	0
1	E	217/226 (96%)	0.26	7 (3%) 50 40	37, 65, 105, 114	0
1	F	219/226 (96%)	0.18	10 (4%) 37 29	41, 64, 92, 115	0
1	G	212/226 (93%)	0.63	12 (5%) 29 22	61, 83, 104, 120	0
1	H	171/226 (75%)	0.77	15 (8%) 15 11	64, 88, 131, 140	0
1	I	194/226 (85%)	0.59	12 (6%) 26 20	57, 85, 133, 153	0
1	J	214/226 (94%)	0.25	6 (2%) 55 45	53, 73, 101, 124	0
1	K	190/226 (84%)	0.46	11 (5%) 29 22	51, 86, 134, 145	0
1	L	214/226 (94%)	0.07	4 (1%) 66 57	47, 67, 89, 103	0
All	All	2469/2712 (91%)	0.34	112 (4%) 38 30	37, 72, 116, 153	0

The worst 5 of 112 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	I	30	LEU	7.2
1	G	219	VAL	4.9
1	J	170	LEU	4.5
1	B	155	VAL	4.4
1	E	153	ALA	4.4

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

6.3 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

6.4 Ligands ⓘ

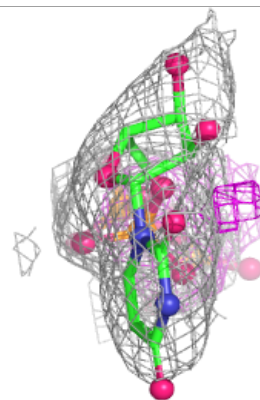
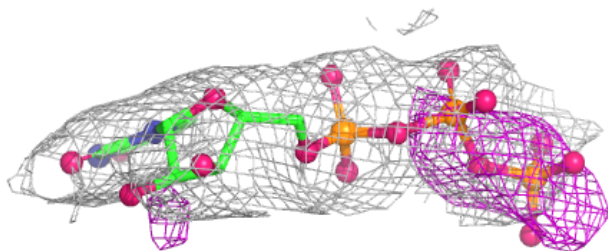
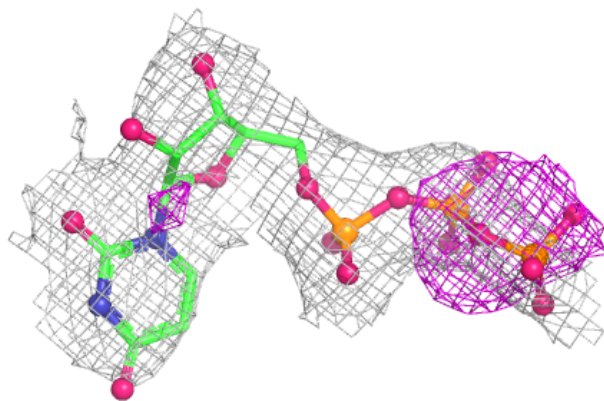
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	MG	E	1228	1/1	0.76	0.12	73,73,73,73	0
3	MG	I	1228	1/1	0.76	0.13	78,78,78,78	0
2	UTP	H	1227	29/29	0.79	0.16	78,92,128,129	0
2	UTP	K	1227	29/29	0.83	0.15	83,92,131,132	0
2	UTP	J	1227	29/29	0.84	0.14	63,72,109,110	0
2	UTP	I	1227	29/29	0.88	0.11	62,78,122,122	0
3	MG	C	1228	1/1	0.88	0.08	66,66,66,66	0
2	UTP	D	1227	29/29	0.89	0.13	56,69,114,115	0
2	UTP	F	1227	29/29	0.90	0.13	64,67,105,105	0
2	UTP	G	1227	29/29	0.90	0.11	71,85,119,119	0
3	MG	B	1228	1/1	0.90	0.08	55,55,55,55	0
2	UTP	B	1227	29/29	0.91	0.12	56,69,111,112	0
2	UTP	A	1227	29/29	0.91	0.12	64,73,109,110	0
2	UTP	E	1227	29/29	0.91	0.13	53,62,97,98	0
2	UTP	L	1227	29/29	0.91	0.13	71,77,110,111	0
3	MG	D	1228	1/1	0.92	0.17	56,56,56,56	0
2	UTP	C	1227	29/29	0.93	0.11	45,58,101,102	0
3	MG	L	1228	1/1	0.95	0.06	55,55,55,55	0
3	MG	J	1228	1/1	0.96	0.07	64,64,64,64	0

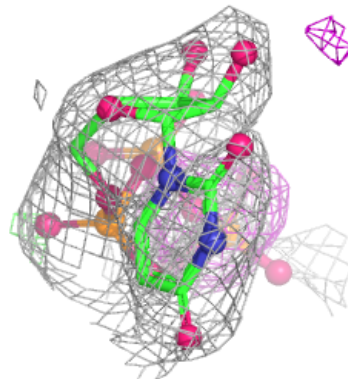
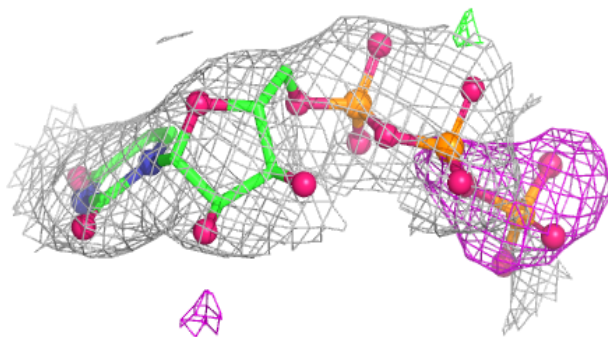
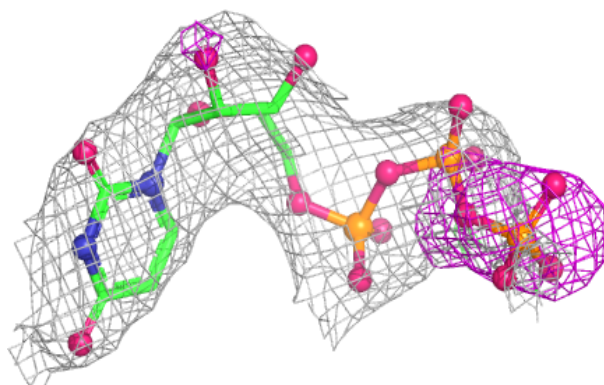
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around UTP H 1227:

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

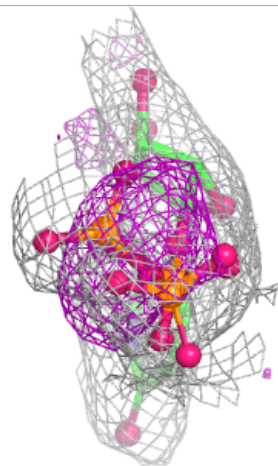
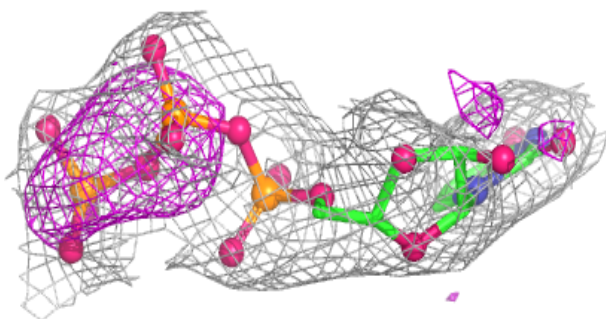
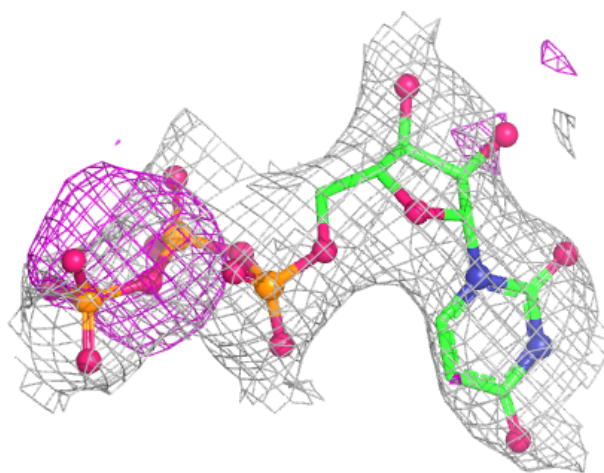
**Electron density around UTP K 1227:**

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



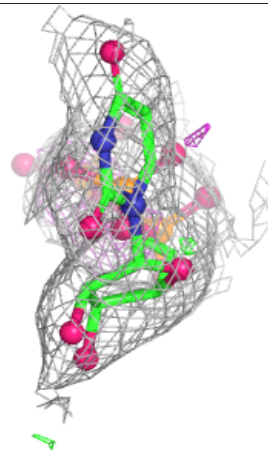
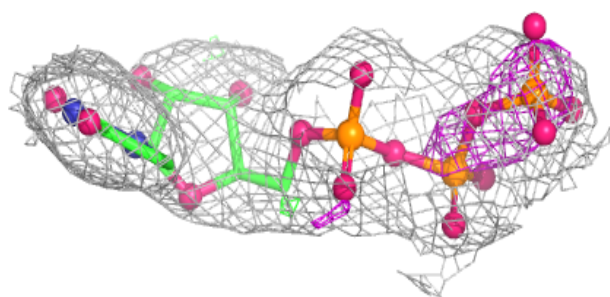
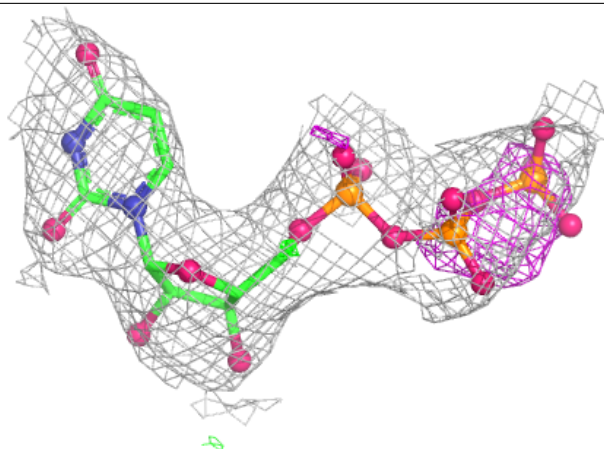
Electron density around UTP J 1227:

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

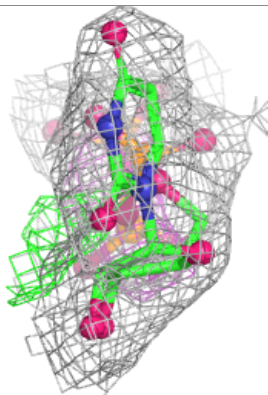
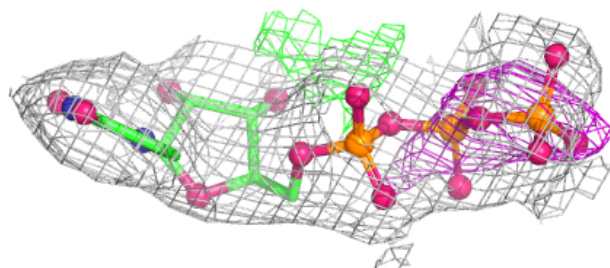
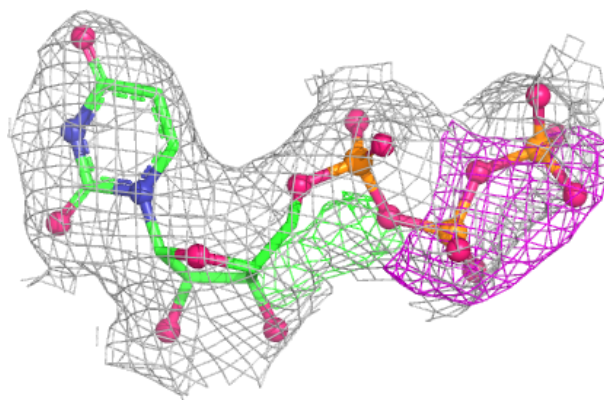


Electron density around UTP I 1227:

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

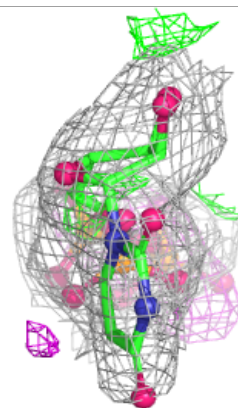
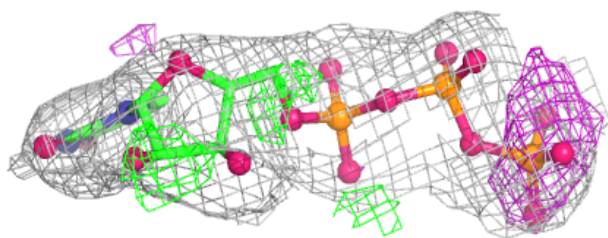
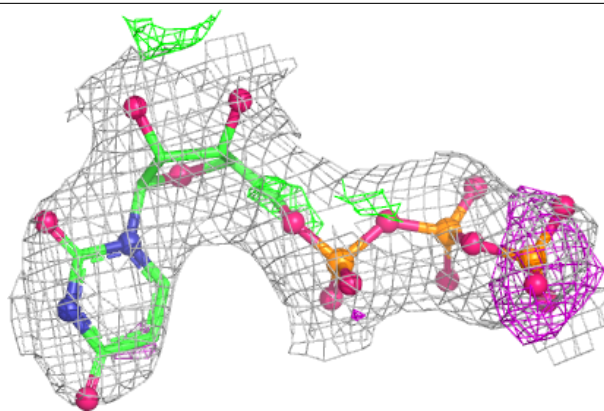
**Electron density around UTP D 1227:**

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

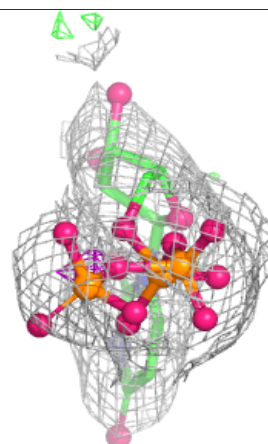
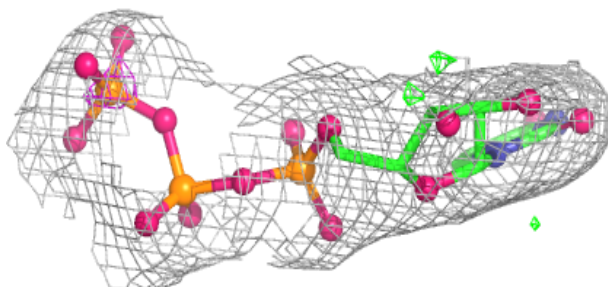
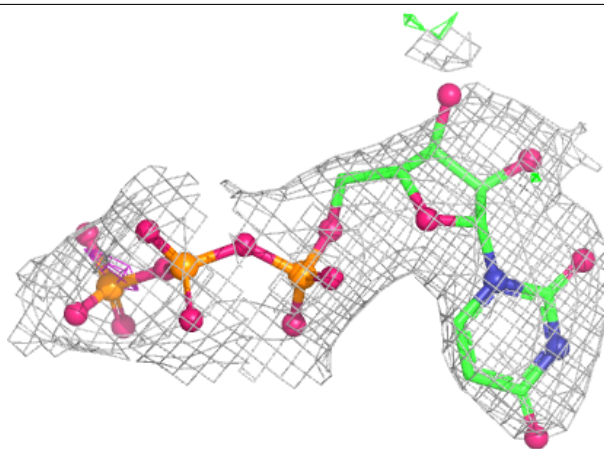


Electron density around UTP F 1227:

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and green (positive)

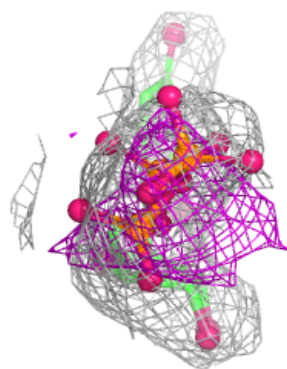
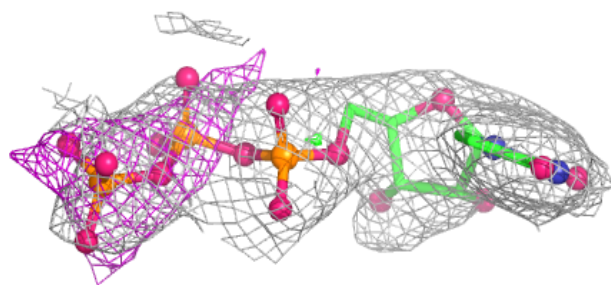
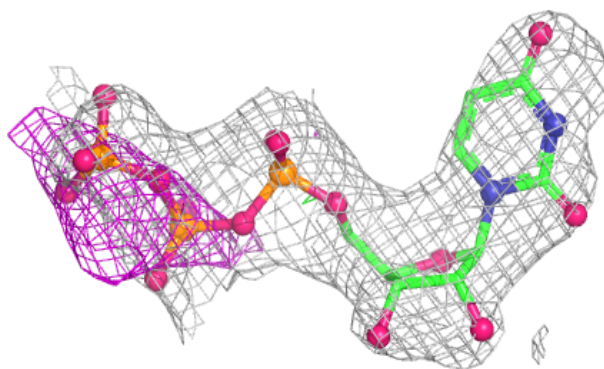
**Electron density around UTP G 1227:**

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

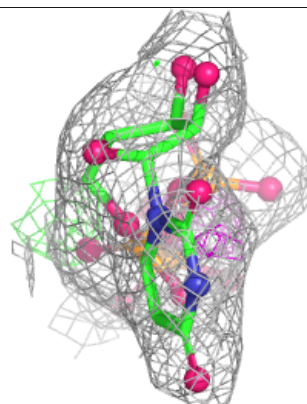
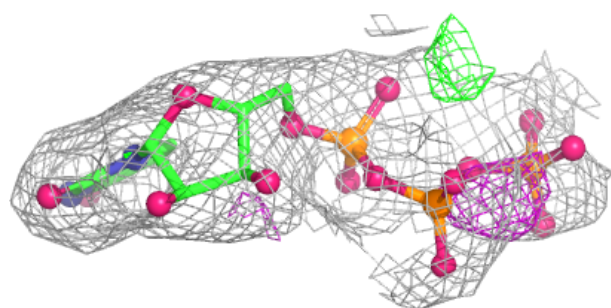
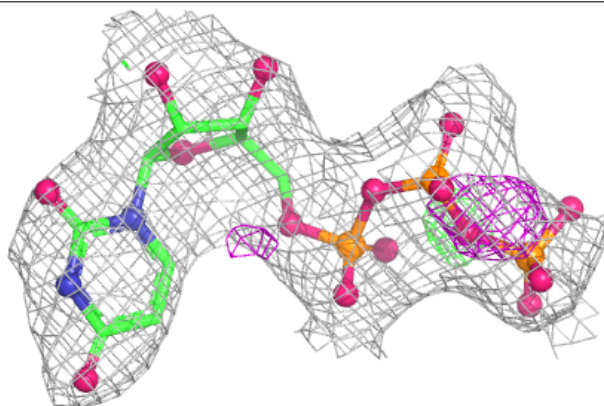


Electron density around UTP B 1227:

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

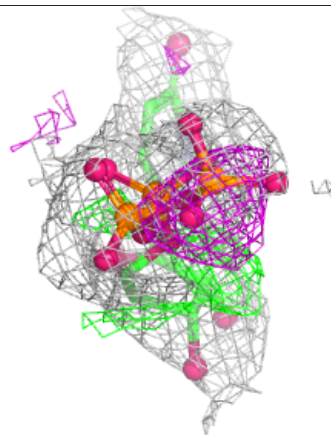
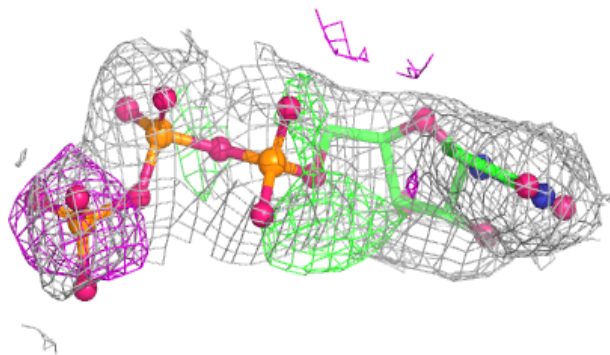
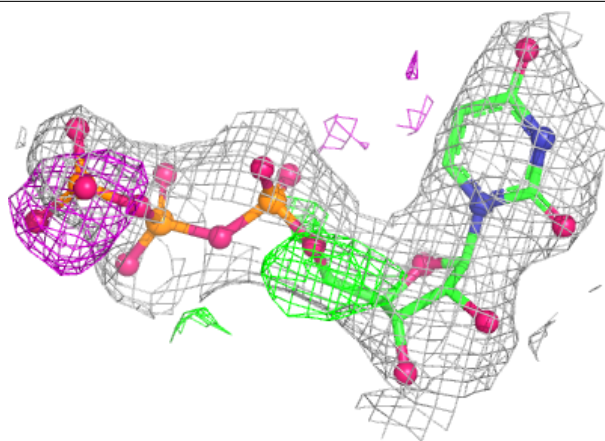
**Electron density around UTP A 1227:**

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



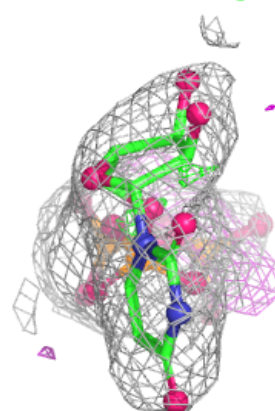
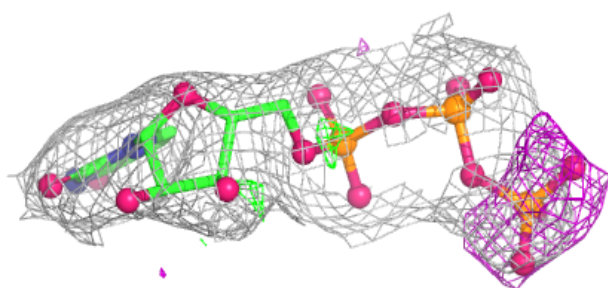
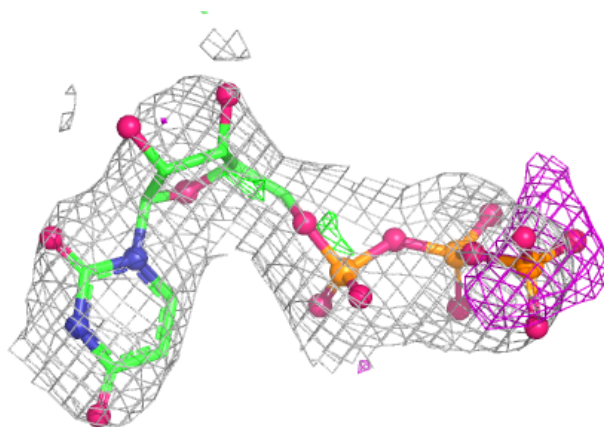
Electron density around UTP E 1227:

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

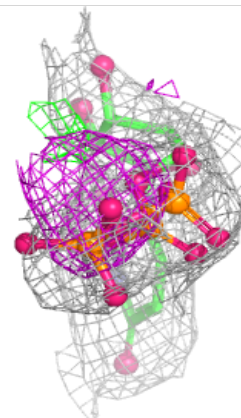
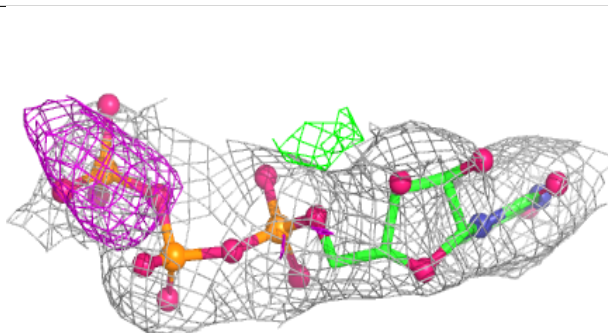
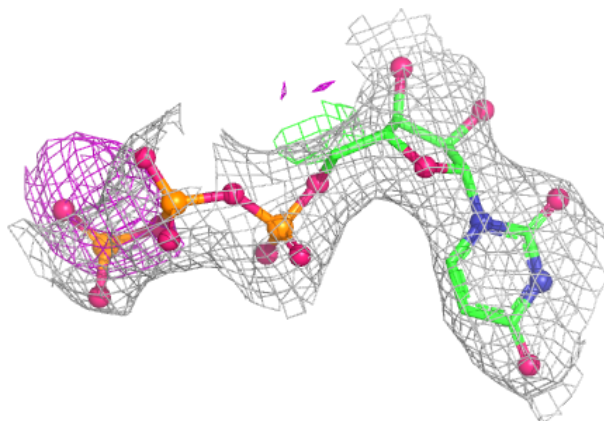


Electron density around UTP L 1227:

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

**Electron density around UTP C 1227:**

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



6.5 Other polymers [i](#)

There are no such residues in this entry.