



Full wwPDB X-ray Structure Validation Report ⓘ

Jul 20, 2026 – 04:16 pm BST

PDB ID : 9SQD / pdb_00009sqd
Title : PaMurU in complex with their natural substrates (UTP and NAM-1P) and Mg²⁺ cofactor
Authors : Jimenez-Faraco, E.; Hermoso, J.A.
Deposited on : 2025-09-22
Resolution : 1.95 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity : 4-5-2 with Phenix2.0
Mogul : 1.8.4, CSD as541be (2020)
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 : 9.0.015 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.50

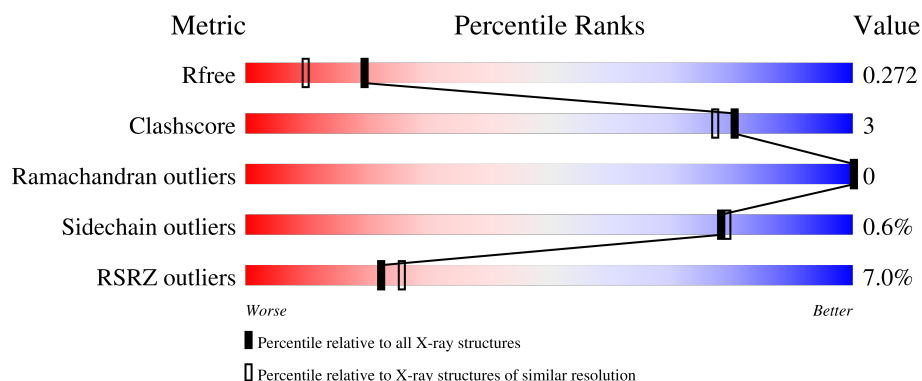
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.95 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	3494 (1.96-1.96)
Clashscore	190562	3612 (1.96-1.96)
Ramachandran outliers	187476	3587 (1.96-1.96)
Sidechain outliers	187428	3587 (1.96-1.96)
RSRZ outliers	180081	3495 (1.96-1.96)

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	239	
1	B	239	
1	C	239	

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 5475 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 N-acetylmuramate alpha-1-phosphate uridylyltransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	C	224	Total	C	N	O	S	0	0	0
			1709	1080	314	311	4			
1	A	222	Total	C	N	O	S	0	0	0
			1697	1073	312	308	4			
1	B	222	Total	C	N	O	S	0	0	0
			1700	1075	312	309	4			

There are 45 discrepancies between the modelled and reference sequences:

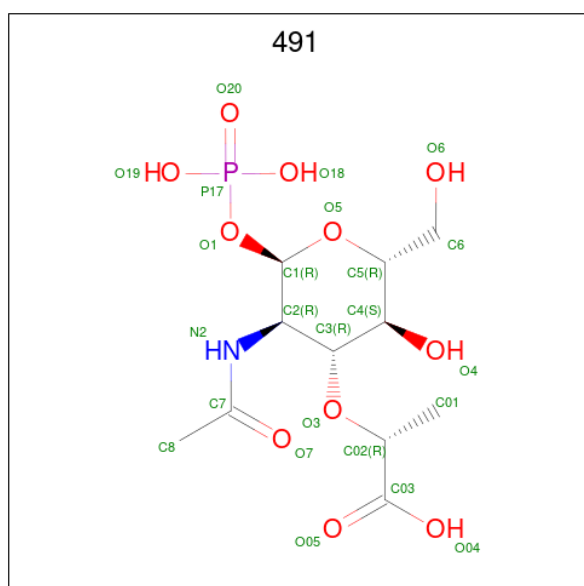
Chain	Residue	Modelled	Actual	Comment	Reference
C	-14	MET	-	initiating methionine	UNP Q9I5U0
C	-13	HIS	-	expression tag	UNP Q9I5U0
C	-12	HIS	-	expression tag	UNP Q9I5U0
C	-11	HIS	-	expression tag	UNP Q9I5U0
C	-10	HIS	-	expression tag	UNP Q9I5U0
C	-9	HIS	-	expression tag	UNP Q9I5U0
C	-8	HIS	-	expression tag	UNP Q9I5U0
C	-7	GLU	-	expression tag	UNP Q9I5U0
C	-6	PHE	-	expression tag	UNP Q9I5U0
C	-5	SER	-	expression tag	UNP Q9I5U0
C	-4	GLN	-	expression tag	UNP Q9I5U0
C	-3	GLN	-	expression tag	UNP Q9I5U0
C	-2	ASP	-	expression tag	UNP Q9I5U0
C	-1	SER	-	expression tag	UNP Q9I5U0
C	0	ASP	-	expression tag	UNP Q9I5U0
A	-14	MET	-	initiating methionine	UNP Q9I5U0
A	-13	HIS	-	expression tag	UNP Q9I5U0
A	-12	HIS	-	expression tag	UNP Q9I5U0
A	-11	HIS	-	expression tag	UNP Q9I5U0
A	-10	HIS	-	expression tag	UNP Q9I5U0
A	-9	HIS	-	expression tag	UNP Q9I5U0
A	-8	HIS	-	expression tag	UNP Q9I5U0
A	-7	GLU	-	expression tag	UNP Q9I5U0

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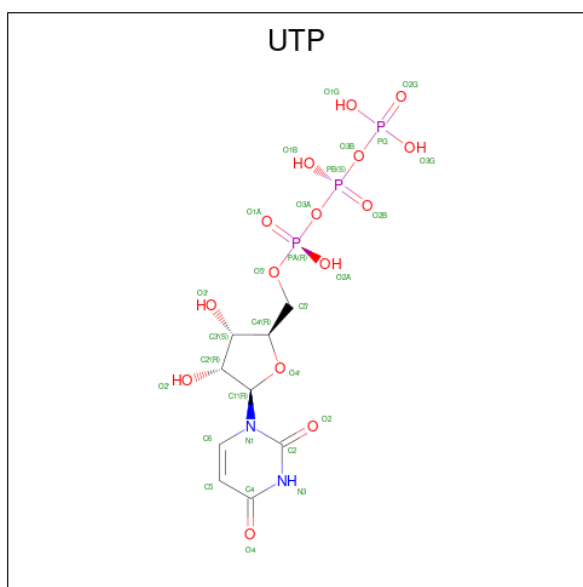
Chain	Residue	Modelled	Actual	Comment	Reference
A	-6	PHE	-	expression tag	UNP Q9I5U0
A	-5	SER	-	expression tag	UNP Q9I5U0
A	-4	GLN	-	expression tag	UNP Q9I5U0
A	-3	GLN	-	expression tag	UNP Q9I5U0
A	-2	ASP	-	expression tag	UNP Q9I5U0
A	-1	SER	-	expression tag	UNP Q9I5U0
A	0	ASP	-	expression tag	UNP Q9I5U0
B	-14	MET	-	initiating methionine	UNP Q9I5U0
B	-13	HIS	-	expression tag	UNP Q9I5U0
B	-12	HIS	-	expression tag	UNP Q9I5U0
B	-11	HIS	-	expression tag	UNP Q9I5U0
B	-10	HIS	-	expression tag	UNP Q9I5U0
B	-9	HIS	-	expression tag	UNP Q9I5U0
B	-8	HIS	-	expression tag	UNP Q9I5U0
B	-7	GLU	-	expression tag	UNP Q9I5U0
B	-6	PHE	-	expression tag	UNP Q9I5U0
B	-5	SER	-	expression tag	UNP Q9I5U0
B	-4	GLN	-	expression tag	UNP Q9I5U0
B	-3	GLN	-	expression tag	UNP Q9I5U0
B	-2	ASP	-	expression tag	UNP Q9I5U0
B	-1	SER	-	expression tag	UNP Q9I5U0
B	0	ASP	-	expression tag	UNP Q9I5U0

- Molecule 2 is 2-acetamido-3-O-[(1R)-1-carboxyethyl]-2-deoxy-1-O-phosphono-alpha-D-glucopyranose (CCD ID: 491) (formula: $C_{11}H_{20}NO_{11}P$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	C	1	Total	C	N	O	P	0	0
			24	11	1	11	1		
2	A	1	Total	C	N	O	P	0	0
			24	11	1	11	1		
2	B	1	Total	C	N	O	P	0	0
			24	11	1	11	1		

- Molecule 3 is URIDINE 5'-TRIPHOSPHATE (CCD ID: UTP) (formula: $C_9H_{15}N_2O_{15}P_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	C	1	Total	C	N	O	P	0	0
			29	9	2	15	3		
3	A	1	Total	C	N	O	P	0	0
			29	9	2	15	3		
3	B	1	Total	C	N	O	P	0	0
			29	9	2	15	3		

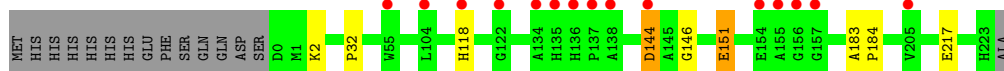
- Molecule 4 is MAGNESIUM ION (CCD ID: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	C	2	Total	Mg	0	0
			2	2		
4	A	2	Total	Mg	0	0
			2	2		
4	B	2	Total	Mg	0	0
			2	2		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	C	72	Total 72	O 72	0	0
5	A	66	Total 66	O 66	0	0
5	B	66	Total 66	O 66	0	0

- Molecule 1: N-acetylmuramate alpha-1-phosphate uridylyltransferase



- [illegible]



- [illegible]



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	51.57Å 51.59Å 72.72Å 90.63° 90.53° 102.62°	Depositor
Resolution (Å)	72.72 – 1.95 72.72 – 1.95	Depositor EDS
% Data completeness (in resolution range)	85.9 (72.72-1.95) 85.9 (72.72-1.95)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.17 (at 1.95Å)	Xtriage
Refinement program	REFMAC 5.8.0425	Depositor
R, R_{free}	0.220 , 0.266 0.226 , 0.272	Depositor DCC
R_{free} test set	2392 reflections (4.49%)	wwPDB-VP
Wilson B-factor (Å ²)	23.8	Xtriage
Anisotropy	0.047	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 28.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.000 for -h,-k,l 0.007 for k,h,-l 0.011 for -k,-h,-l	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	5475	wwPDB-VP
Average B, all atoms (Å ²)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 15.48% 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: MG, 491, UTP

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	0.60	0/1738	1.10	1/2359 (0.0%)
1	B	0.60	0/1741	1.07	1/2363 (0.0%)
1	C	0.62	0/1751	1.08	3/2378 (0.1%)
All	All	0.60	0/5230	1.08	5/7100 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	B	0	2

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	160	THR	CA-CB-OG1	-5.84	100.83	109.60
1	C	217	GLU	CB-CG-CD	5.55	122.03	112.60
1	C	151	GLU	CB-CG-CD	5.19	121.42	112.60
1	B	48	ASP	CA-CB-CG	5.15	117.75	112.60
1	C	144	ASP	CA-CB-CG	5.11	117.71	112.60

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	187	ARG	Sidechain
1	B	69	ARG	Sidechain

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	1697	0	1670	11	0
1	B	1700	0	1671	13	0
1	C	1709	0	1680	4	0
2	A	24	0	3	1	0
2	B	24	0	3	0	0
2	C	24	0	3	0	0
3	A	29	0	11	1	0
3	B	29	0	11	0	0
3	C	29	0	11	0	0
4	A	2	0	0	0	0
4	B	2	0	0	0	0
4	C	2	0	0	0	0
5	A	66	0	0	4	0
5	B	66	0	0	1	0
5	C	72	0	0	2	0
All	All	5475	0	5063	27	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 3.

All (27) 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:185:LEU:HG	5:B:408:HOH:O	1.73	0.87
1:B:116:ARG:HH11	1:B:116:ARG:HG2	1.67	0.59
1:B:140:ASP:O	1:B:152:THR:HG23	2.05	0.57
1:B:103:LEU:C	1:B:104:LEU:HD12	2.32	0.55
1:A:221:ALA:HB1	1:B:58:GLU:HG3	1.90	0.53
1:A:5:ILE:HD12	1:A:5:ILE:N	2.27	0.50
1:C:2:LYS:HB3	5:C:401:HOH:O	2.12	0.50
1:B:134:ALA:O	1:B:137:PRO:HD3	2.11	0.50
1:A:183:ALA:HB3	1:A:184:PRO:HD3	1.93	0.49
1:A:221:ALA:HB1	1:B:58:GLU:CG	2.43	0.49
1:A:151:GLU:HG2	5:A:417:HOH:O	2.13	0.48
1:A:14:MET:HG3	1:A:208:GLY:O	2.14	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:5:ILE:N	1:B:5:ILE:HD12	2.30	0.47
2:A:301:491:O20	3:A:302:UTP:PA	2.73	0.46
1:A:181:LYS:HB3	5:A:458:HOH:O	2.16	0.45
1:A:17:THR:OG1	1:A:210:HIS:HE1	1.99	0.45
1:A:135:HIS:HE1	5:A:456:HOH:O	2.00	0.45
1:B:58:GLU:HG2	1:B:59:GLN:N	2.32	0.44
1:B:93:LEU:N	1:B:94:PRO:CD	2.81	0.44
1:A:45:GLY:HA2	5:A:421:HOH:O	2.17	0.43
1:B:6:LEU:HD21	1:B:89:ILE:HG13	1.99	0.43
1:B:190:ILE:HG13	1:B:195:VAL:HG21	2.00	0.43
1:C:144:ASP:OD1	1:C:146:GLY:N	2.53	0.42
1:C:183:ALA:HB3	1:C:184:PRO:HD3	2.02	0.42
1:A:18:THR:HA	1:A:21:THR:O	2.19	0.42
1:B:183:ALA:HB3	1:B:184:PRO:HD3	2.01	0.41
1:C:151:GLU:HG2	5:C:469:HOH:O	2.20	0.41

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	218/239 (91%)	212 (97%)	6 (3%)	0	100	100
1	B	218/239 (91%)	209 (96%)	9 (4%)	0	100	100
1	C	222/239 (93%)	215 (97%)	7 (3%)	0	100	100
All	All	658/717 (92%)	636 (97%)	22 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	169/183 (92%)	168 (99%)	1 (1%)	78	79
1	B	169/183 (92%)	169 (100%)	0	100	100
1	C	169/183 (92%)	167 (99%)	2 (1%)	63	61
All	All	507/549 (92%)	504 (99%)	3 (1%)	78	79

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	32	PRO
1	C	118	HIS
1	A	32	PRO

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	210	HIS
1	B	59	GLN
1	B	203	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry

Of 12 ligands modelled in this entry, 6 are monoatomic - leaving 6 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	491	A	301	4	23,24,24	1.13	2 (8%)	30,35,35	1.43	5 (16%)
2	491	B	302	4	23,24,24	0.85	1 (4%)	30,35,35	1.05	2 (6%)
3	UTP	A	302	4	26,30,30	0.95	2 (7%)	39,47,47	2.47	7 (17%)
3	UTP	B	301	4	26,30,30	1.01	2 (7%)	39,47,47	2.40	7 (17%)
3	UTP	C	302	4	26,30,30	1.00	2 (7%)	39,47,47	2.43	7 (17%)
2	491	C	301	4	23,24,24	1.04	1 (4%)	30,35,35	1.47	2 (6%)

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	491	A	301	4	-	1/18/39/39	0/1/1/1
2	491	B	302	4	-	2/18/39/39	0/1/1/1
3	UTP	A	302	4	-	4/22/38/38	0/2/2/2
3	UTP	B	301	4	-	7/22/38/38	0/2/2/2
3	UTP	C	302	4	-	6/22/38/38	0/2/2/2
2	491	C	301	4	-	2/18/39/39	0/1/1/1

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	302	UTP	C4-N3	-2.77	1.33	1.38
3	C	302	UTP	C4-N3	-2.77	1.33	1.38
3	B	301	UTP	C4-N3	-2.77	1.33	1.38
3	B	301	UTP	C5-C4	-2.70	1.37	1.43
3	A	302	UTP	C5-C4	-2.59	1.37	1.43
3	C	302	UTP	C5-C4	-2.49	1.38	1.43

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	302	491	P17-O20	2.36	1.58	1.50
2	A	301	491	C02-C03	2.34	1.55	1.52
2	C	301	491	C4-C5	2.08	1.57	1.53
2	A	301	491	P17-O20	2.06	1.57	1.50

All (30) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	302	UTP	C4-N3-C2	-9.10	114.58	126.58
3	A	302	UTP	C4-N3-C2	-9.09	114.59	126.58
3	B	301	UTP	C4-N3-C2	-9.03	114.66	126.58
3	A	302	UTP	C5-C4-N3	8.53	127.60	114.84
3	C	302	UTP	C5-C4-N3	8.41	127.42	114.84
3	B	301	UTP	C5-C4-N3	8.37	127.36	114.84
2	C	301	491	O5-C1-O1	4.81	117.65	111.36
3	B	301	UTP	N3-C2-N1	4.65	121.06	114.89
3	A	302	UTP	N3-C2-N1	4.20	120.46	114.89
3	C	302	UTP	N3-C2-N1	4.20	120.46	114.89
3	B	301	UTP	O4-C4-C5	-4.02	118.10	125.16
3	A	302	UTP	O4-C4-N3	-3.98	113.46	119.31
3	C	302	UTP	O4-C4-N3	-3.78	113.76	119.31
3	C	302	UTP	O4-C4-C5	-3.66	118.73	125.16
3	A	302	UTP	O4-C4-C5	-3.56	118.90	125.16
2	A	301	491	O5-C5-C4	3.27	115.64	109.69
3	B	301	UTP	O4-C4-N3	-3.25	114.53	119.31
2	A	301	491	O19-P17-O18	3.11	119.53	107.64
2	A	301	491	O5-C1-O1	3.03	115.33	111.36
3	C	302	UTP	C6-C5-C4	-2.75	115.75	119.52
3	A	302	UTP	C6-C5-C4	-2.72	115.80	119.52
2	A	301	491	O3-C3-C4	2.66	114.36	107.28
3	B	301	UTP	C6-C5-C4	-2.64	115.91	119.52
2	A	301	491	C01-C02-C03	2.59	113.55	109.28
2	C	301	491	O4-C4-C5	2.45	115.39	109.30
2	B	302	491	C1-C2-N2	2.44	115.20	111.00
2	B	302	491	O5-C1-C2	-2.20	106.27	110.58
3	B	301	UTP	O2-C2-N3	-2.10	117.58	121.50
3	C	302	UTP	O1G-PG-O3B	2.08	111.61	104.64
3	A	302	UTP	O2-C2-N1	-2.04	120.08	122.79

There are no chirality outliers.

All (22) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	301	491	C03-C02-O3-C3
2	C	301	491	C1-O1-P17-O18
3	C	302	UTP	C5'-O5'-PA-O1A
3	C	302	UTP	C5'-O5'-PA-O2A
3	A	302	UTP	C5'-O5'-PA-O1A
3	A	302	UTP	C5'-O5'-PA-O2A
3	B	301	UTP	C5'-O5'-PA-O1A
3	B	301	UTP	C5'-O5'-PA-O2A
3	A	302	UTP	C5'-O5'-PA-O3A
3	B	301	UTP	PB-O3A-PA-O1A
3	C	302	UTP	PG-O3B-PB-O1B
3	A	302	UTP	PG-O3B-PB-O1B
3	B	301	UTP	PG-O3B-PB-O1B
3	C	302	UTP	PB-O3A-PA-O2A
2	A	301	491	C4-C5-C6-O6
2	B	302	491	C1-O1-P17-O19
3	C	302	UTP	C5'-O5'-PA-O3A
3	B	301	UTP	C5'-O5'-PA-O3A
3	C	302	UTP	PB-O3A-PA-O1A
3	B	301	UTP	PB-O3A-PA-O2A
3	B	301	UTP	PG-O3B-PB-O2B
2	B	302	491	C1-O1-P17-O20

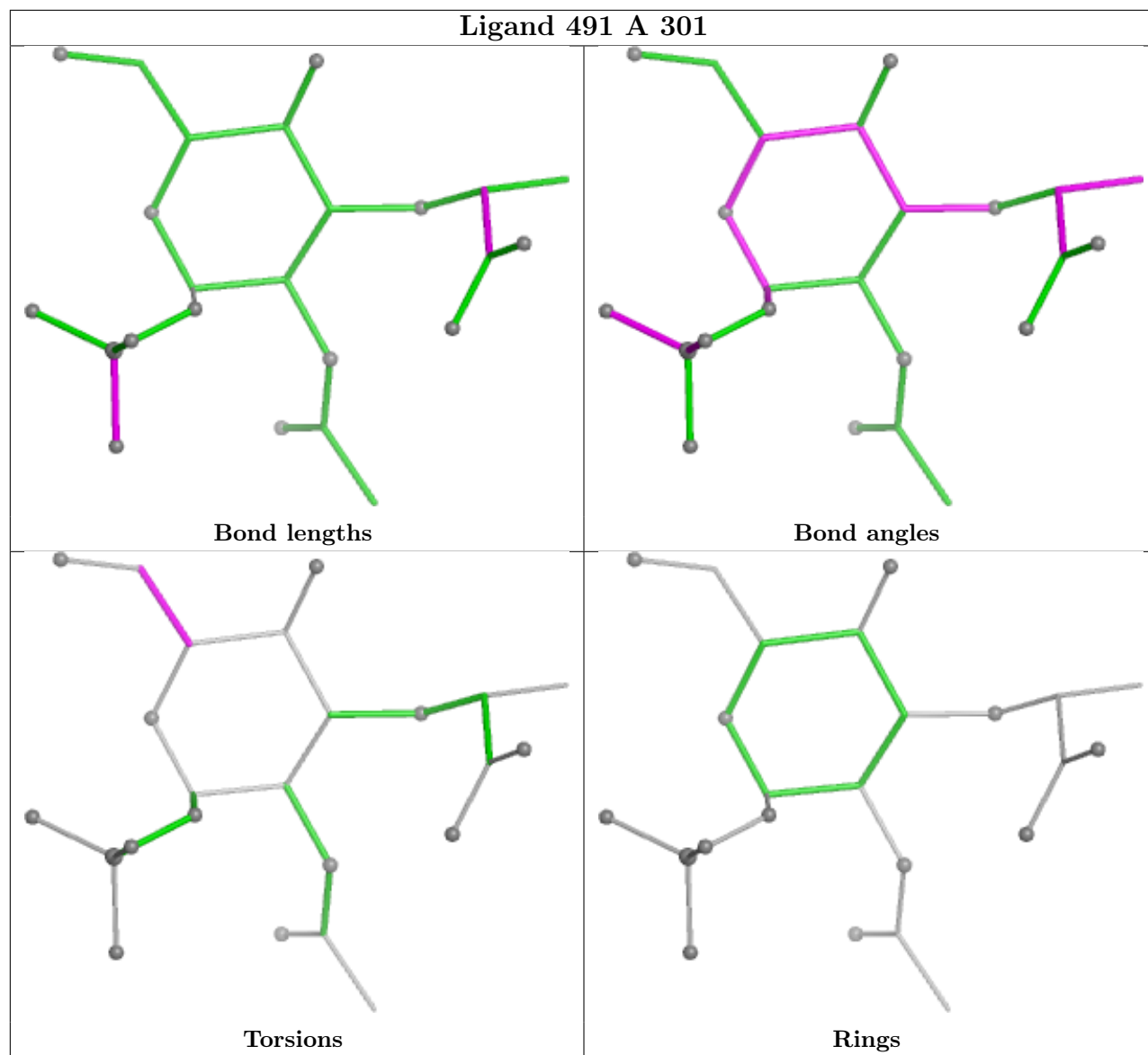
There are no ring outliers.

2 monomers are involved in 1 short contact:

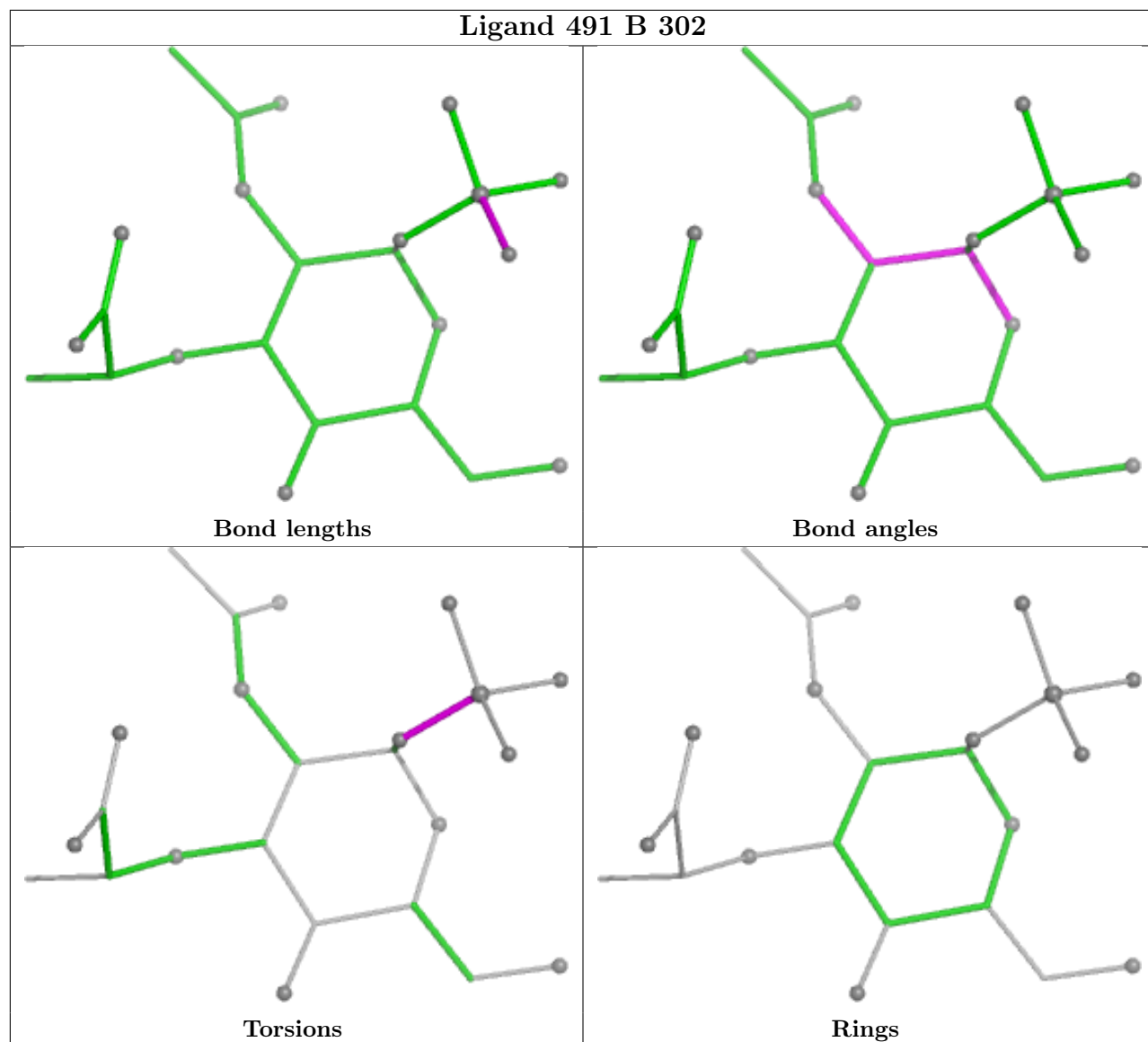
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	301	491	1	0
3	A	302	UTP	1	0

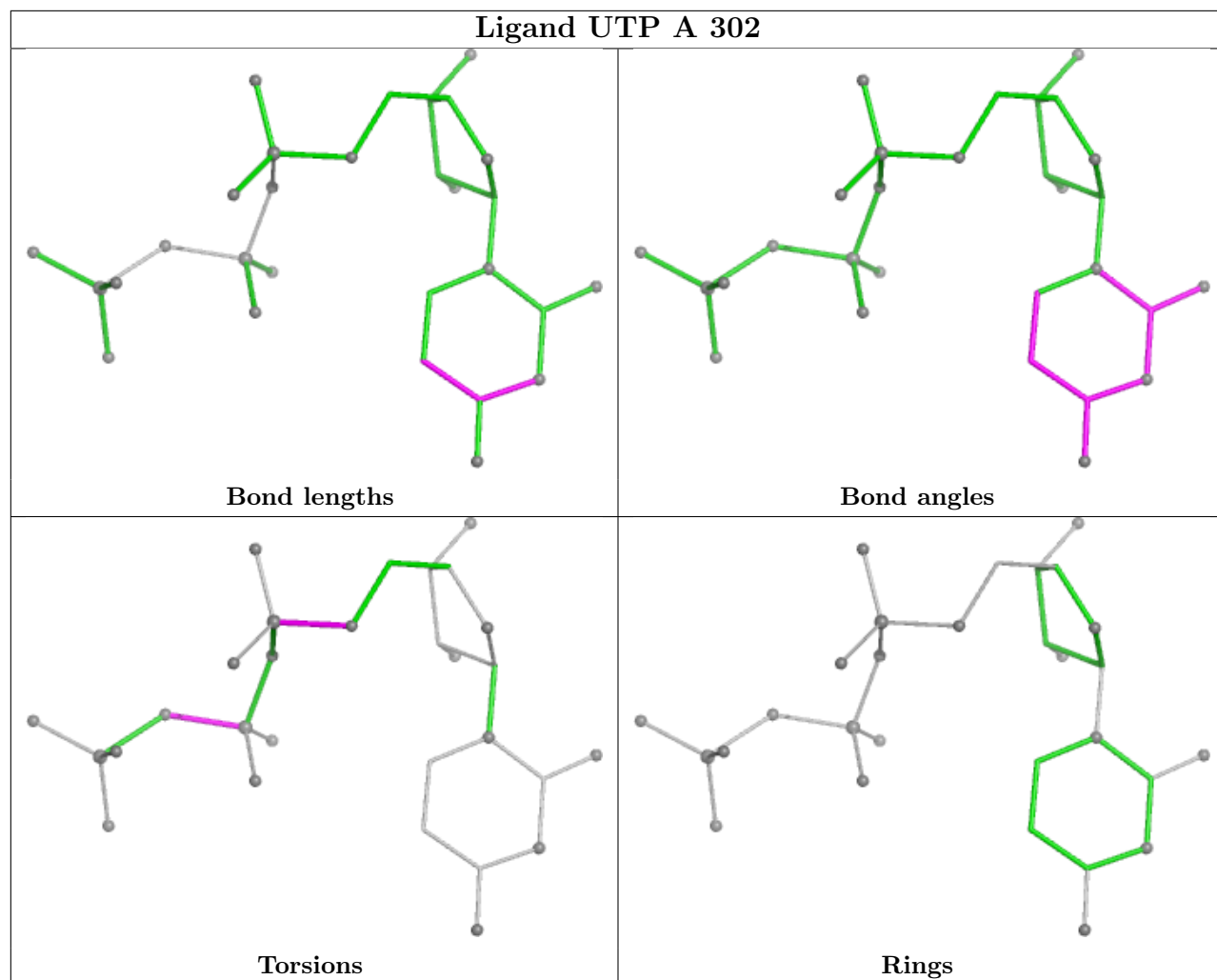
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

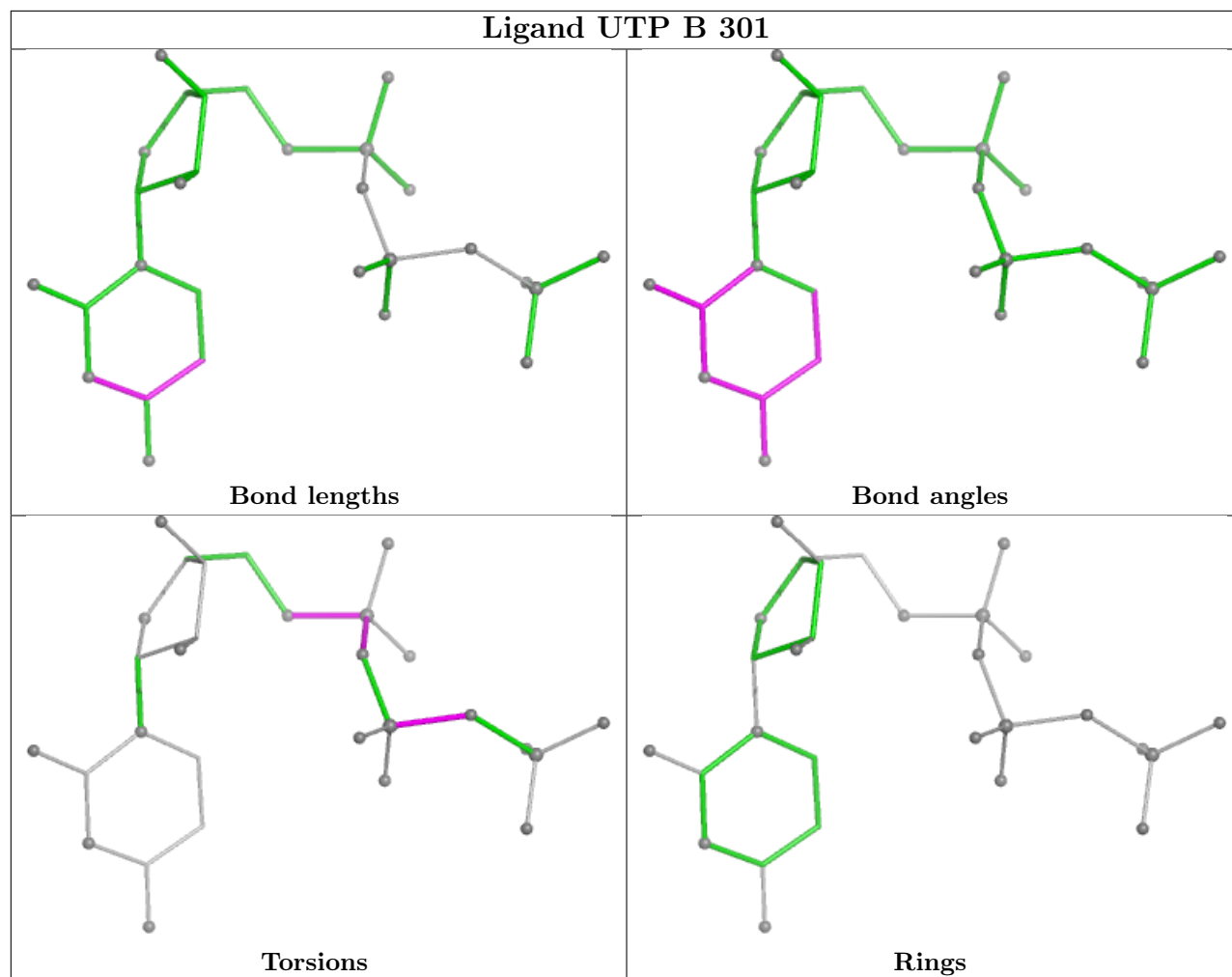
Ligand 491 A 301

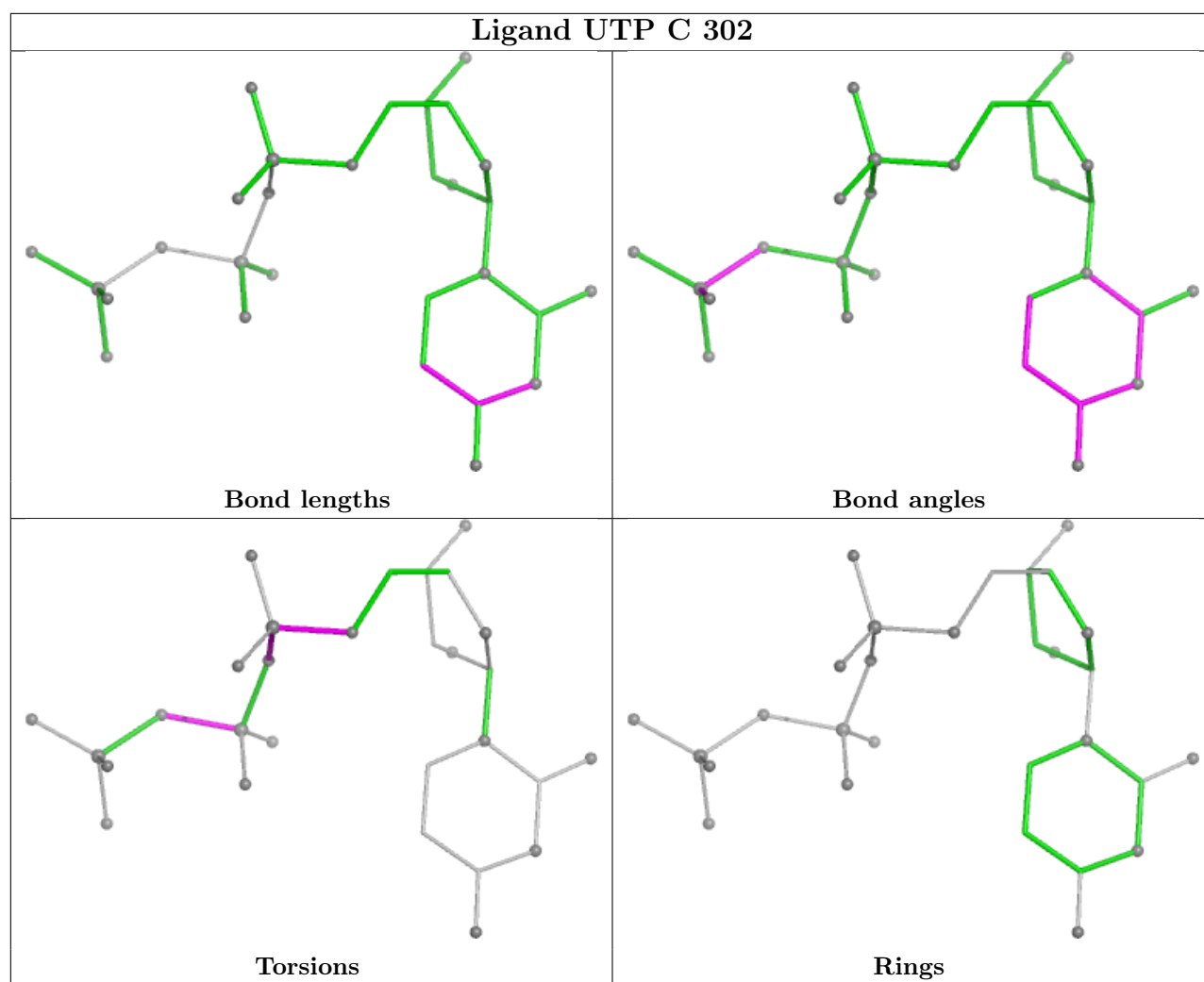


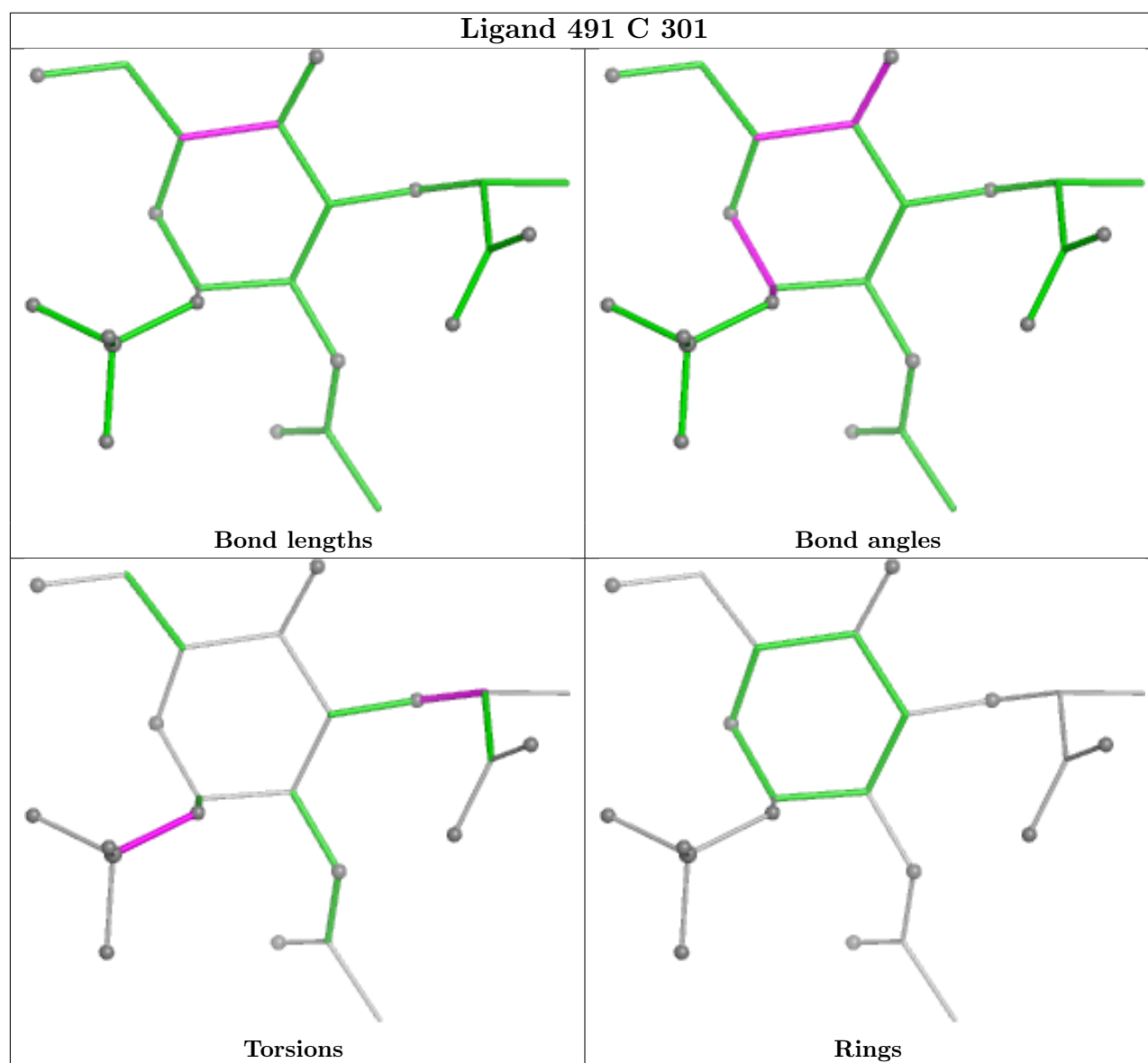
Ligand 491 B 302











5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	222/239 (92%)	0.80	14 (6%) 26 30	16, 25, 40, 56	0
1	B	222/239 (92%)	0.80	18 (8%) 18 21	15, 24, 43, 67	0
1	C	224/239 (93%)	0.67	15 (6%) 24 27	15, 22, 39, 66	0
All	All	668/717 (93%)	0.76	47 (7%) 22 26	15, 24, 43, 67	0

All (47) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	157	GLY	4.3
1	B	154	GLU	4.1
1	B	118	HIS	4.1
1	C	134	ALA	3.7
1	B	157	GLY	3.6
1	B	134	ALA	3.6
1	A	118	HIS	3.4
1	C	118	HIS	3.2
1	C	138	ALA	3.1
1	C	205	VAL	2.8
1	C	136	HIS	2.8
1	A	120	ALA	2.8
1	C	154	GLU	2.7
1	A	97	GLY	2.6
1	C	137	PRO	2.6
1	C	144	ASP	2.6
1	A	223	HIS	2.5
1	C	156	GLY	2.5
1	A	15	ARG	2.4
1	B	120	ALA	2.4
1	B	97	GLY	2.4
1	A	215	GLU	2.4
1	B	158	ASN	2.4

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Mol	Chain	Res	Type	RSRZ
1	B	45	GLY	2.4
1	B	58	GLU	2.4
1	B	203	GLN	2.4
1	C	155	ALA	2.3
1	A	182	LEU	2.3
1	B	104	LEU	2.3
1	B	139	GLY	2.2
1	B	147	GLY	2.2
1	C	104	LEU	2.2
1	C	55	TRP	2.2
1	A	55	TRP	2.2
1	B	55	TRP	2.2
1	C	135	HIS	2.2
1	C	122	GLY	2.2
1	B	145	ALA	2.2
1	A	187	ARG	2.2
1	A	20	HIS	2.1
1	B	193	GLY	2.1
1	B	170	ALA	2.1
1	C	157	GLY	2.1
1	A	135	HIS	2.1
1	A	1	MET	2.0
1	B	152	THR	2.0
1	A	45	GLY	2.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

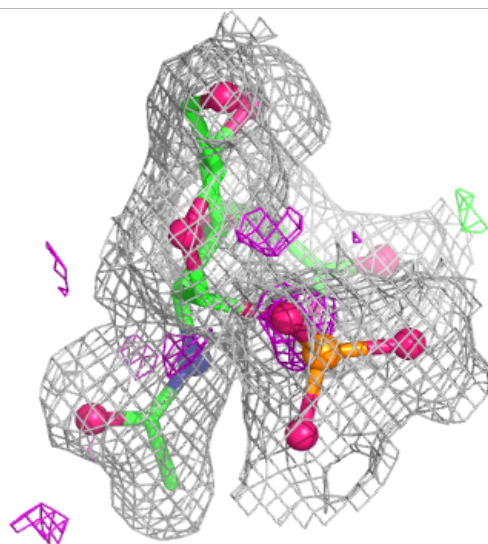
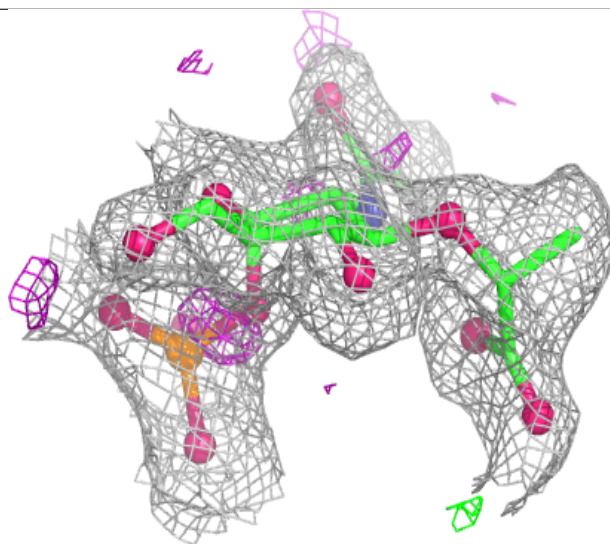
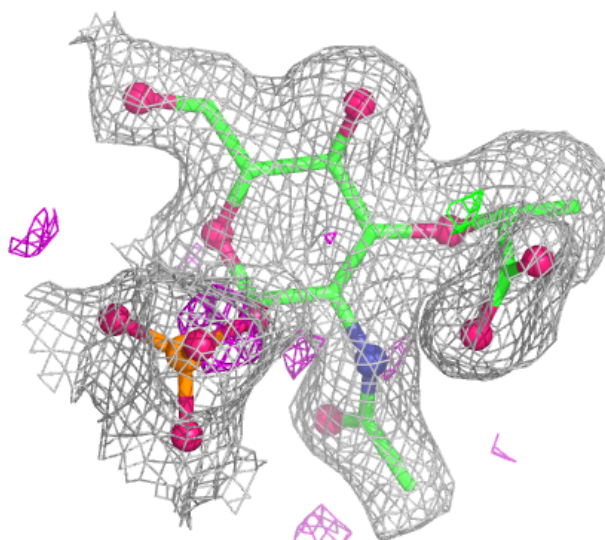
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	491	A	301	24/24	0.85	0.11	20,25,34,37	0
2	491	B	302	24/24	0.87	0.11	26,30,42,43	0
2	491	C	301	24/24	0.89	0.10	21,25,36,41	0
3	UTP	A	302	29/29	0.89	0.10	19,22,32,35	0
3	UTP	B	301	29/29	0.91	0.09	18,24,38,39	0
3	UTP	C	302	29/29	0.92	0.08	16,20,30,31	0
4	MG	C	303	1/1	0.96	0.04	17,17,17,17	0
4	MG	C	304	1/1	0.96	0.05	27,27,27,27	0
4	MG	B	304	1/1	0.97	0.05	27,27,27,27	0
4	MG	A	303	1/1	0.98	0.05	19,19,19,19	0
4	MG	B	303	1/1	0.99	0.03	18,18,18,18	0
4	MG	A	304	1/1	0.99	0.05	21,21,21,21	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.

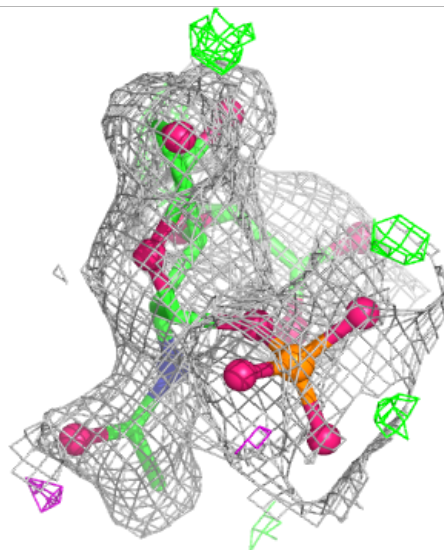
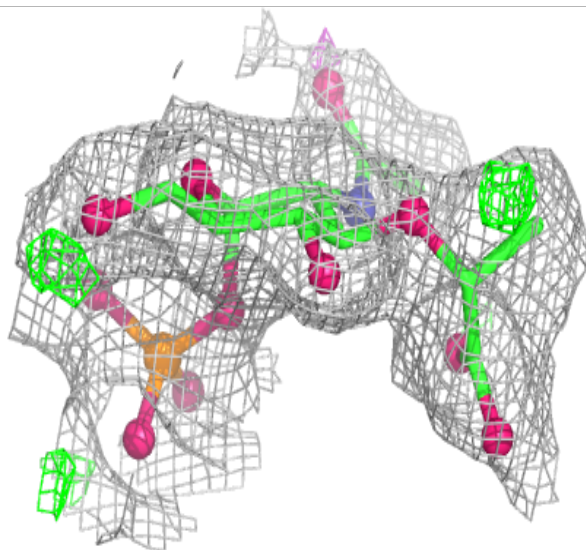
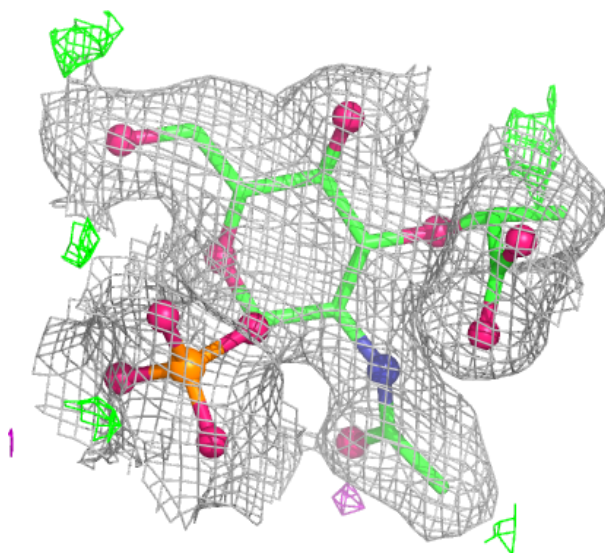
Electron density around 491 A 301:

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



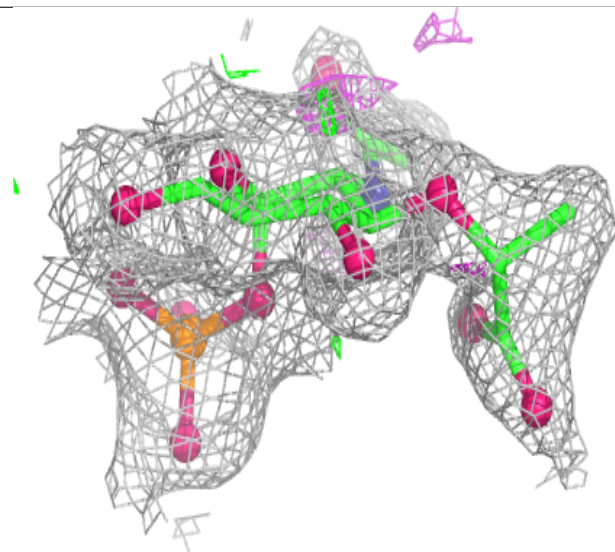
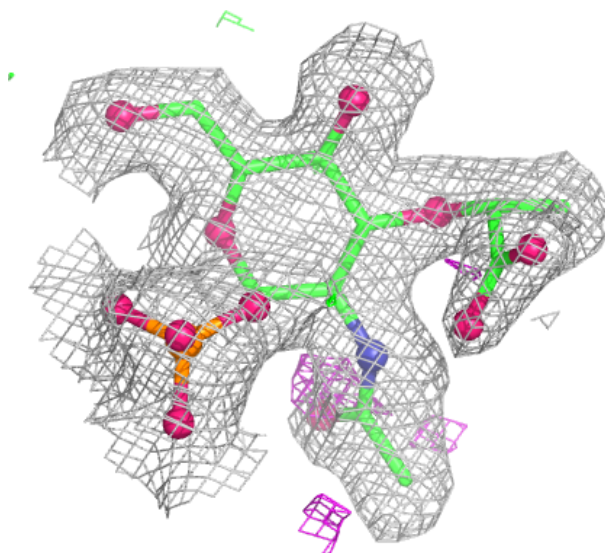
Electron density around 491 B 302:

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



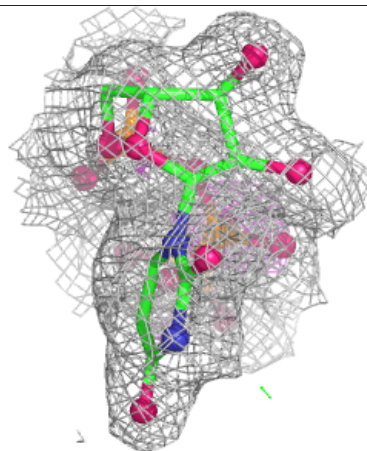
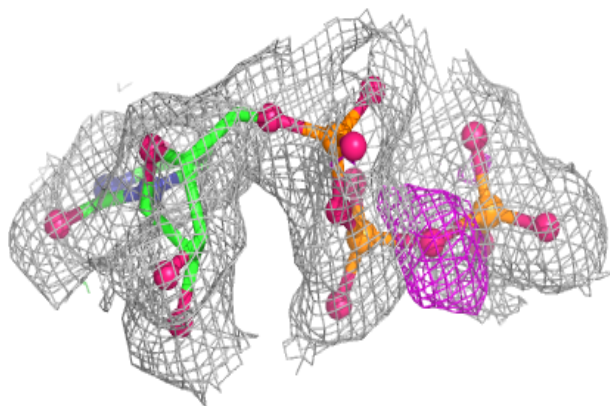
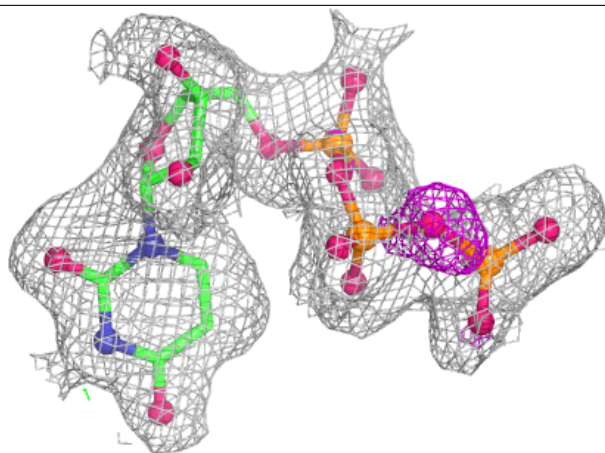
Electron density around 491 C 301:

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



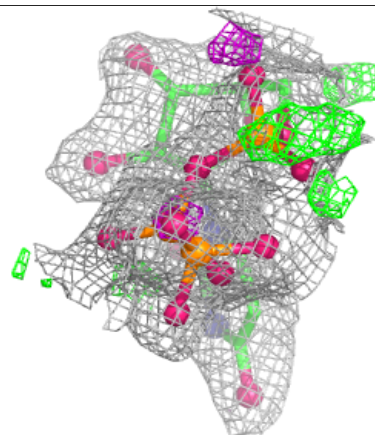
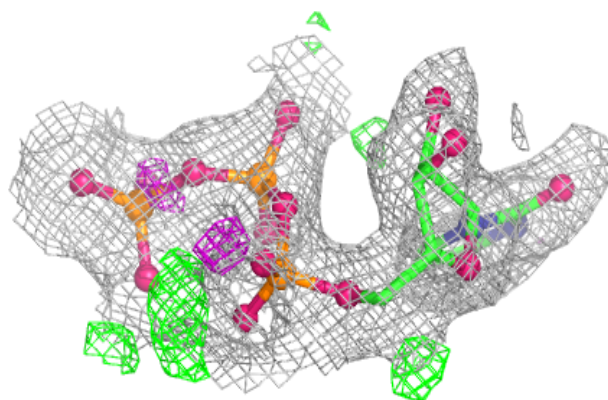
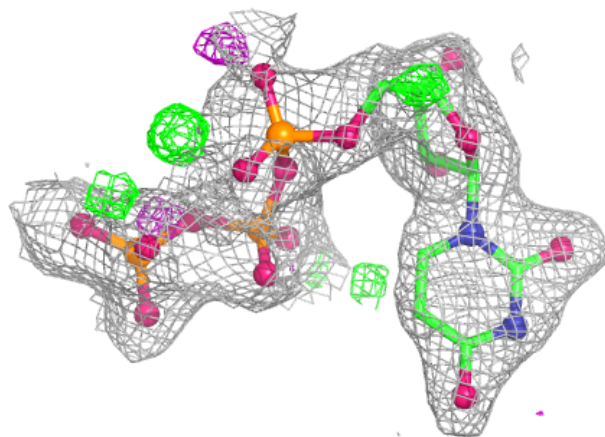
Electron density around UTP A 302:

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



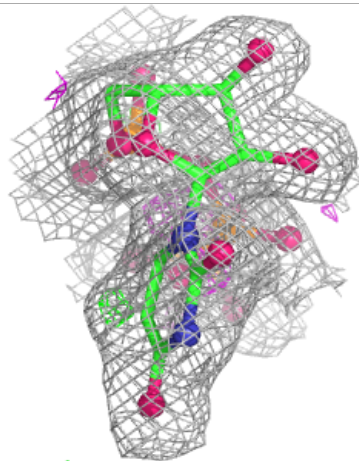
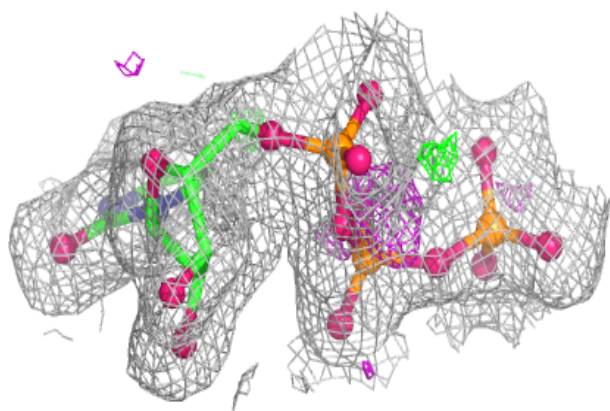
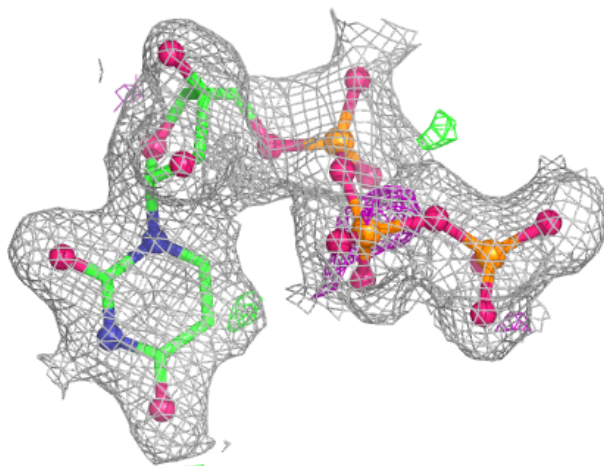
Electron density around UTP B 301:

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



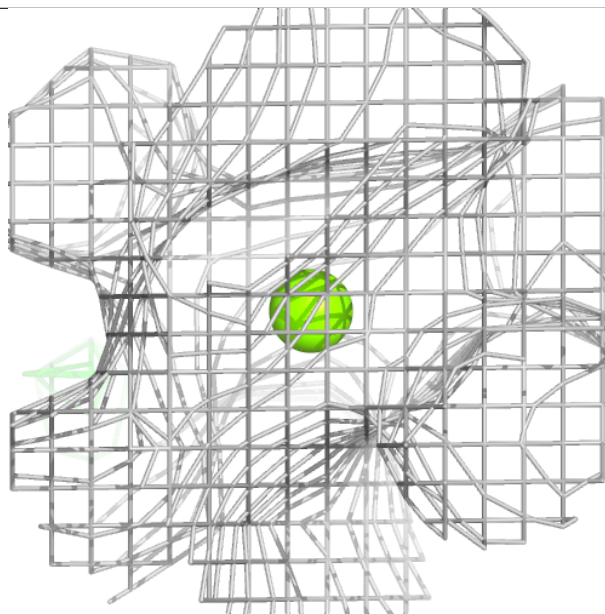
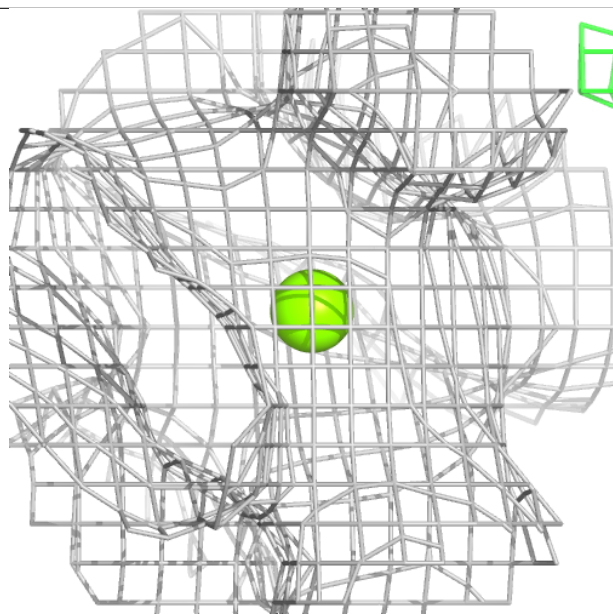
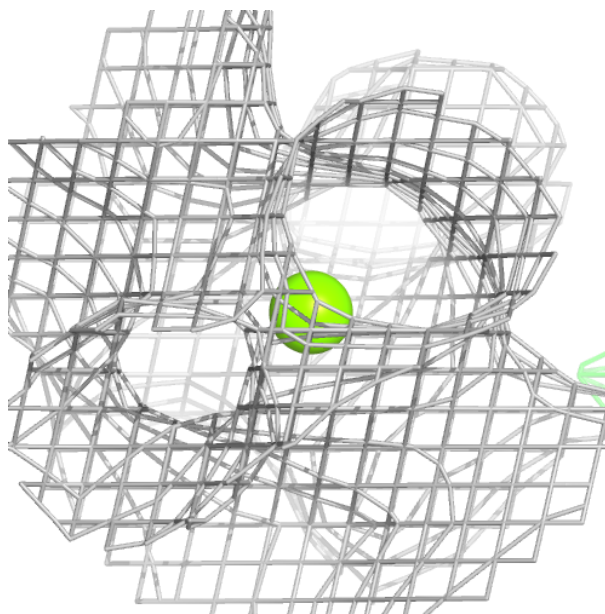
Electron density around UTP C 302:

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



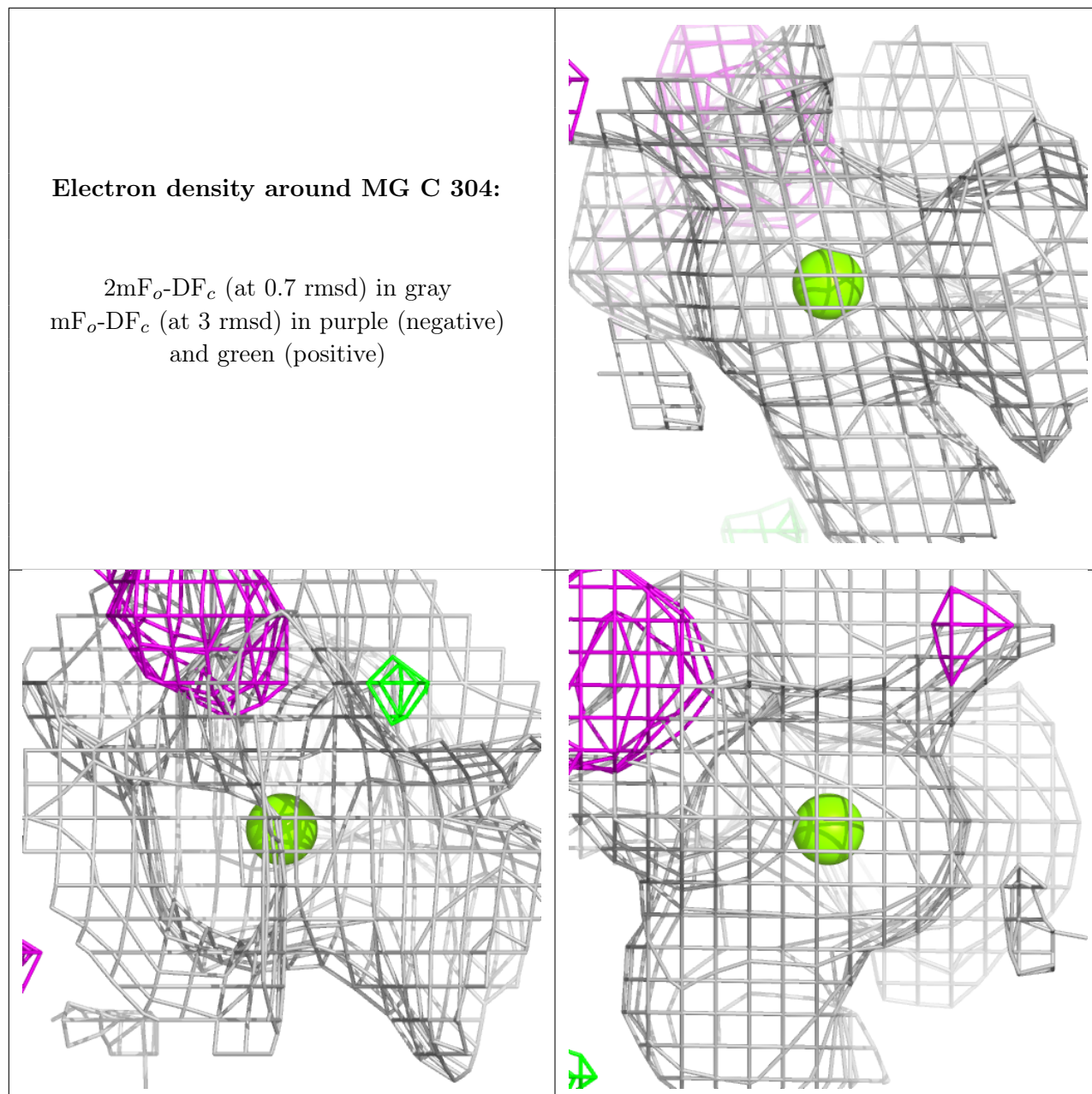
Electron density around MG C 303:

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and green (positive)



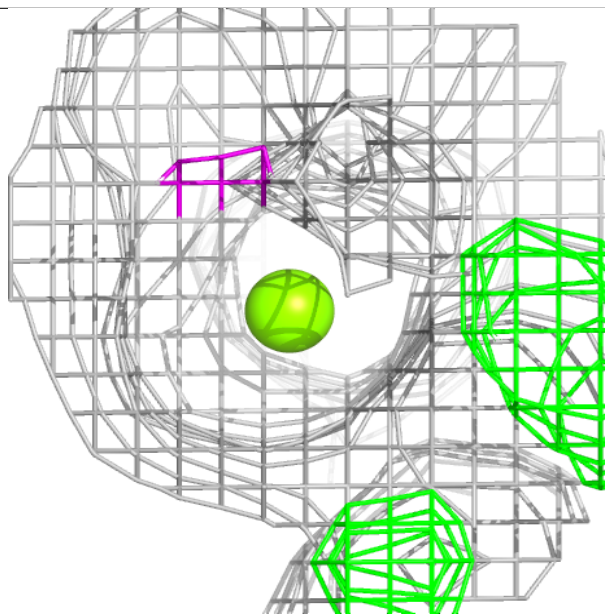
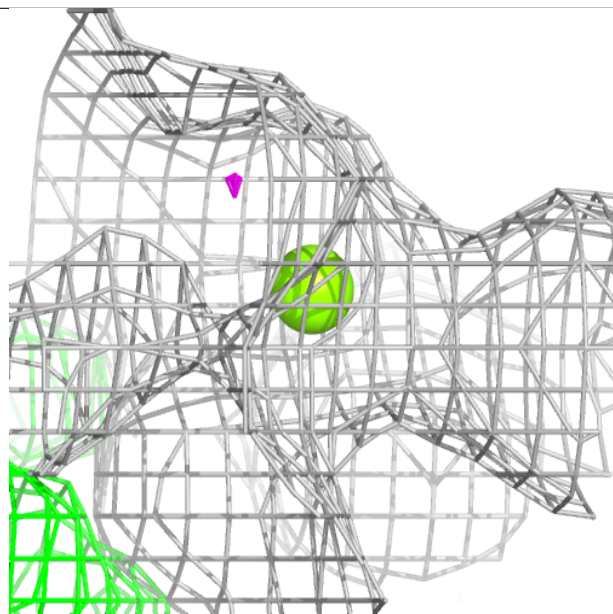
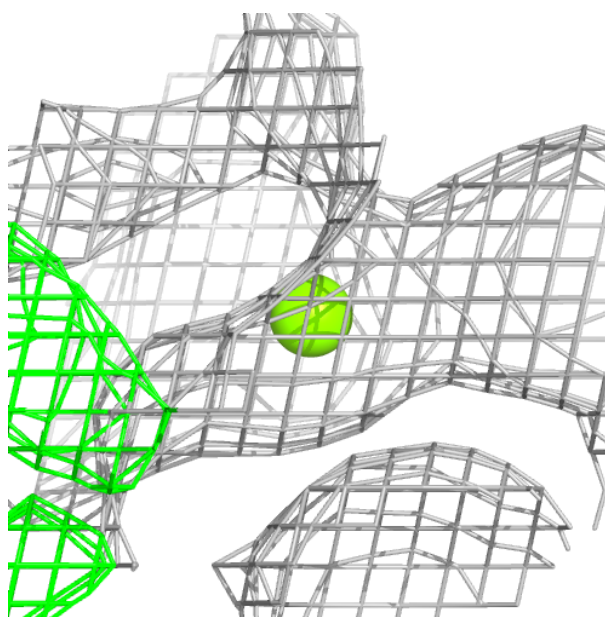
Electron density around MG C 304:

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and green (positive)



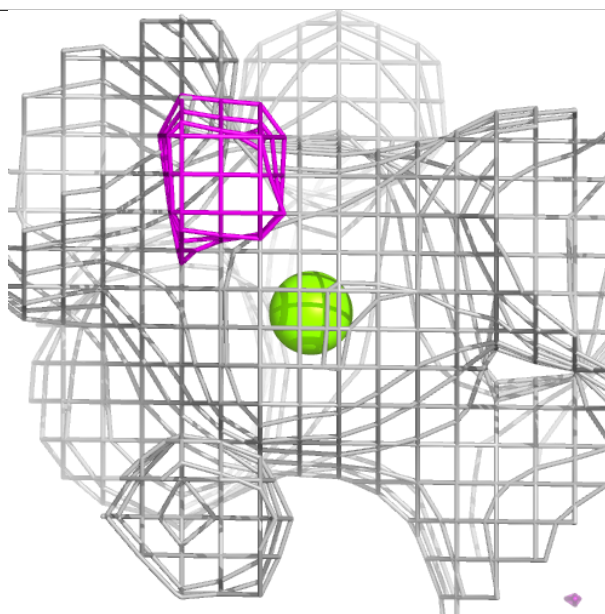
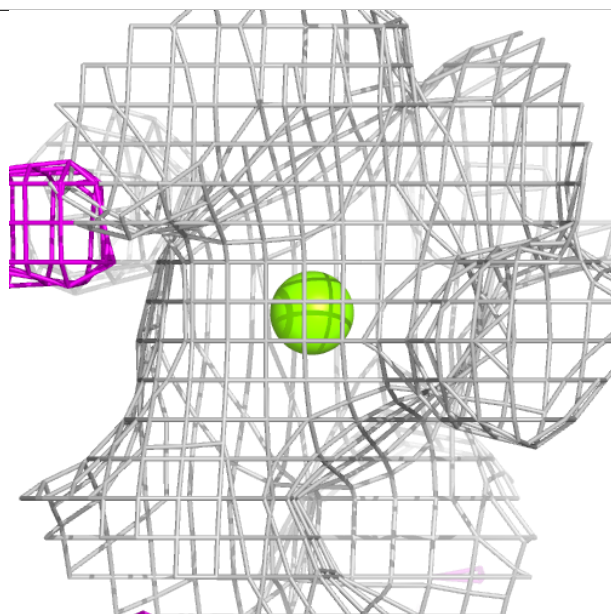
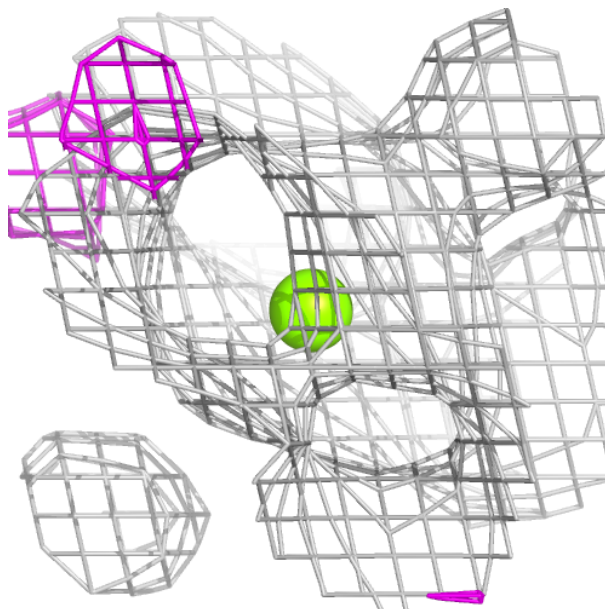
Electron density around MG B 304:

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and green (positive)



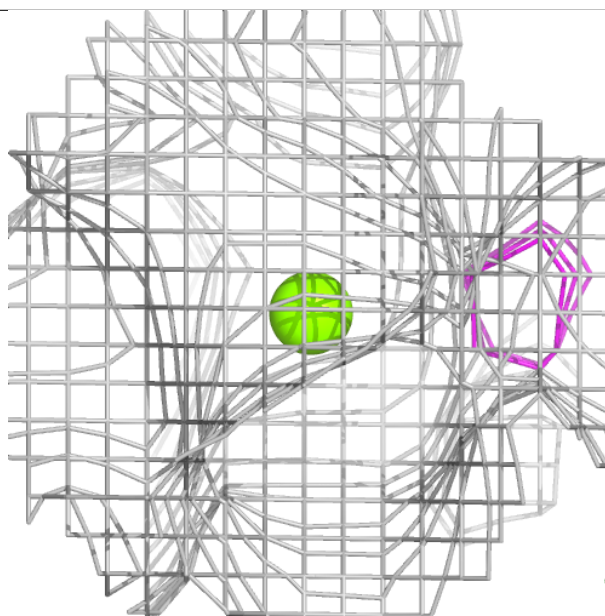
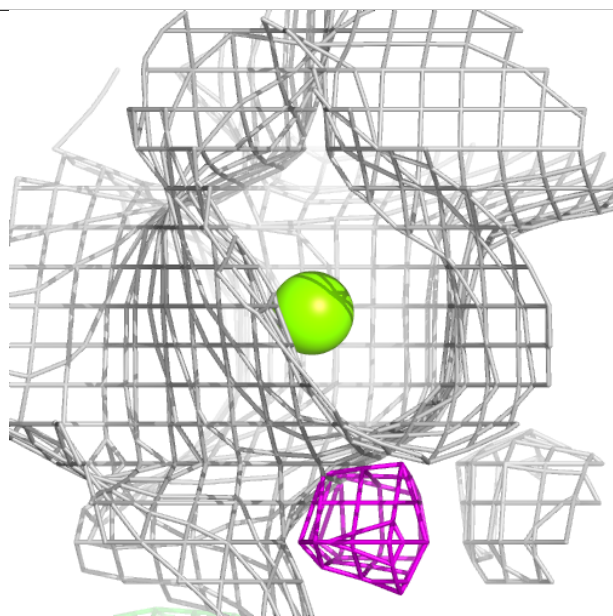
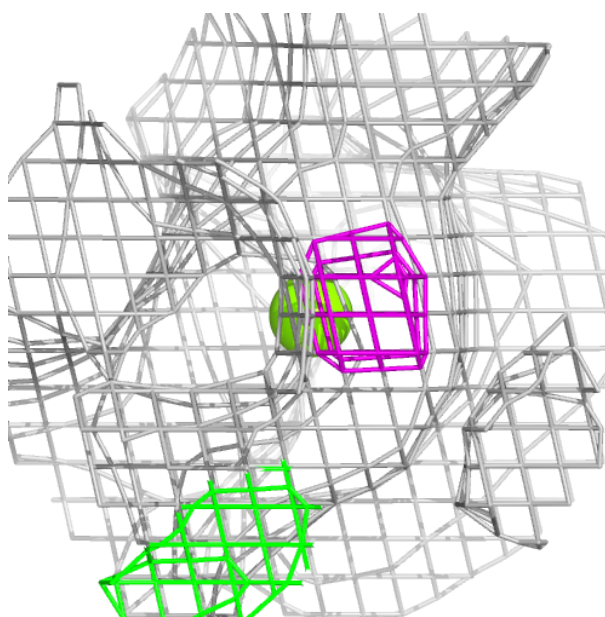
Electron density around MG A 303:

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and green (positive)



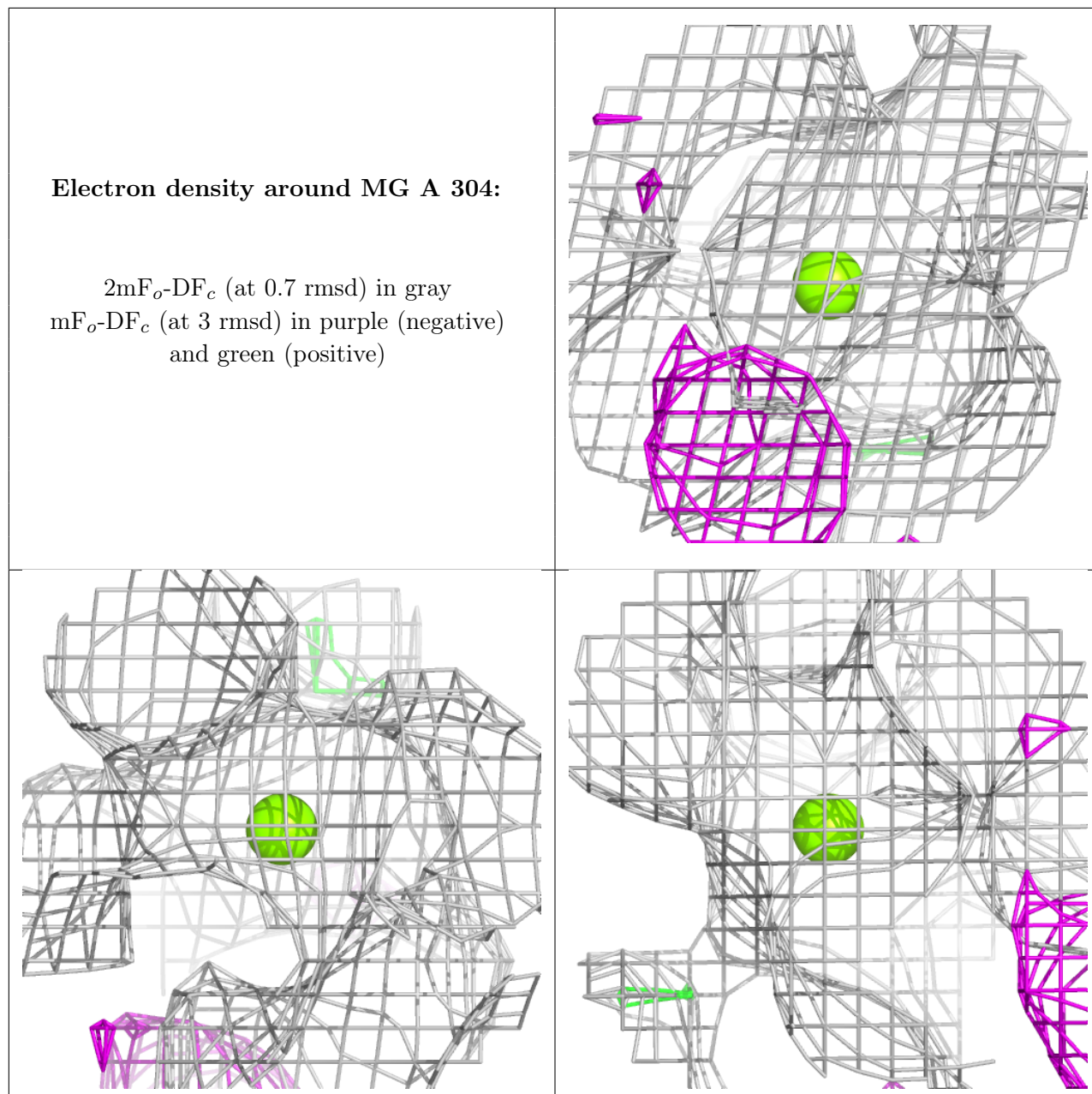
Electron density around MG B 303:

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and green (positive)



Electron density around MG A 304:

$2mF_o-DF_c$ (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.