



wwPDB X-ray Structure Validation Summary Report

Apr 18, 2026 – 04:59 PM UTC

PDB ID : 4ISK / pdb_00004isk
Title : Crystal structure of E.coli thymidylate synthase with dUMP and the BGC 945 inhibitor
Authors : Tochowicz, A.; Finer-Moore, J.; Stroud, R.M.
Deposited on : 2013-01-16
Resolution : 1.75 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

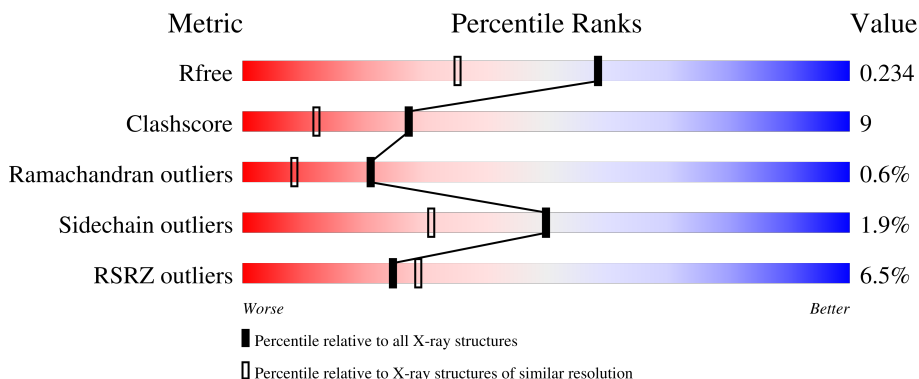
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.75 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	3183 (1.76-1.76)
Clashscore	190562	3299 (1.76-1.76)
Ramachandran outliers	187476	3274 (1.76-1.76)
Sidechain outliers	187428	3274 (1.76-1.76)
RSRZ outliers	180081	3183 (1.76-1.76)

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	264	3% 84% 14% .
1	B	264	2% 86% 13% .
1	C	264	3% 89% 10% .
1	D	264	% 84% 15% .
1	E	264	6% 83% 16% .

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Mol	Chain	Length	Quality of chain
1	F	264	<p>7% 79% 20%</p>
1	G	264	<p>10% 81% 18%</p>
1	H	264	<p>19% 78% 20%</p>

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
1	CXM	A	1	-	-	X	-

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 37528 atoms, of which 18746 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.

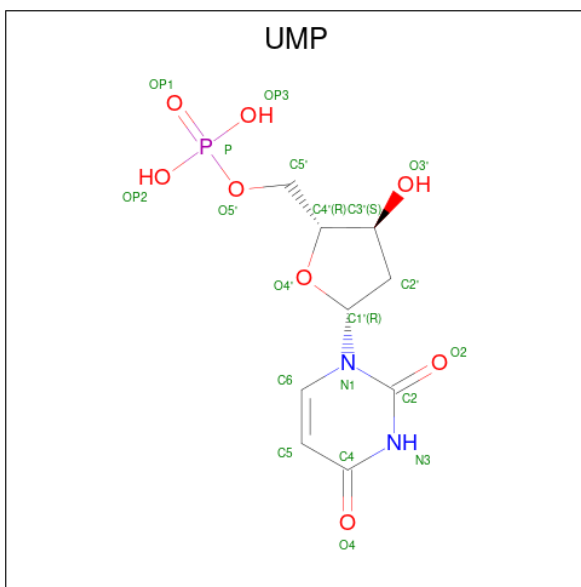
- Molecule 1 is a protein called Thymidylate synthase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	264	4243	1375	2091	371	394	12	20	0	0
1	B	264	4263	1380	2102	374	395	12	0	2	0
1	C	264	4239	1375	2086	371	395	12	0	0	0
1	D	264	4243	1375	2090	371	395	12	0	0	0
1	E	264	4242	1375	2089	371	395	12	0	0	0
1	F	264	4263	1380	2102	374	395	12	27	1	0
1	G	264	4239	1375	2086	371	395	12	20	0	0
1	H	264	4242	1375	2089	371	395	12	200	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	CXM	-	expression tag	UNP P0A884
B	1	CXM	-	expression tag	UNP P0A884
C	1	CXM	-	expression tag	UNP P0A884
D	1	CXM	-	expression tag	UNP P0A884
E	1	CXM	-	expression tag	UNP P0A884
F	1	CXM	-	expression tag	UNP P0A884
G	1	CXM	-	expression tag	UNP P0A884
H	1	CXM	-	expression tag	UNP P0A884

- Molecule 2 is 2'-DEOXYURIDINE 5'-MONOPHOSPHATE (CCD ID: UMP) (formula: C₉H₁₃N₂O₈P).

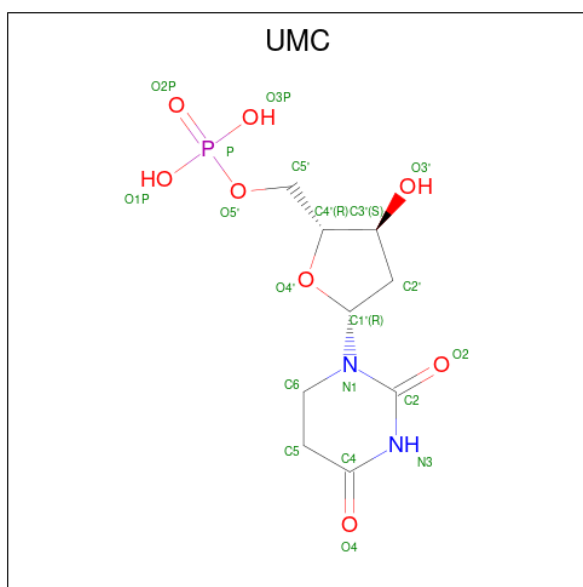


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	H	N	O			P
2	A	1	31	9	11	2	8	1	0	0
2	C	1	31	9	11	2	8	1	0	0
2	G	1	31	9	11	2	8	1	0	0

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

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
3	A	1	1	1	0	0
3	B	1	1	1	0	0
3	C	1	1	1	0	0
3	D	1	1	1	0	0
3	E	1	1	1	0	0
3	G	1	1	1	0	0
3	H	1	1	1	0	0

- Molecule 4 is N-(4-{{(6S)-2-(hydroxymethyl)-4-oxo-4,6,7,8-tetrahydro-1H-cyclopenta[g]quinazolin-6-yl}}(prop-2-yn-1-yl)amino}benzoyl)-L-gamma-glutamyl-D-glutamic acid (CCD ID: 1JY) (formula: C₃₂H₃₃N₅O₁₀).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	H	N	O			P
5	B	1	Total	C	H	N	O	P	0	0
			32	9	12	2	8	1		
5	D	1	Total	C	H	N	O	P	0	0
			32	9	12	2	8	1		
5	E	1	Total	C	H	N	O	P	0	0
			32	9	12	2	8	1		
5	F	1	Total	C	H	N	O	P	0	0
			32	9	12	2	8	1		
5	H	1	Total	C	H	N	O	P	0	0
			32	9	12	2	8	1		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	H	O		
6	A	184	Total	H	O	0	0
			540	356	184		
6	B	169	Total	H	O	0	0
			495	326	169		
6	C	168	Total	H	O	0	0
			492	324	168		
6	D	131	Total	H	O	0	0
			381	250	131		
6	E	129	Total	H	O	0	0
			377	248	129		
6	F	92	Total	H	O	0	0
			276	184	92		
6	G	74	Total	H	O	0	0
			210	136	74		

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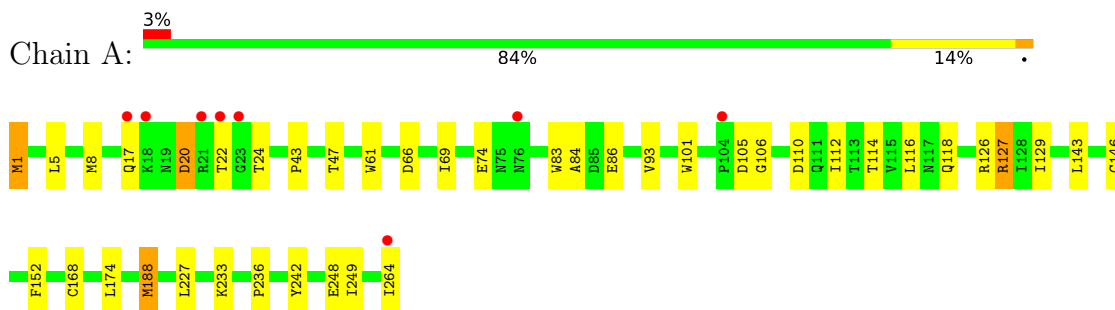
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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	H	O		
6	H	53	147	94	53	0	0

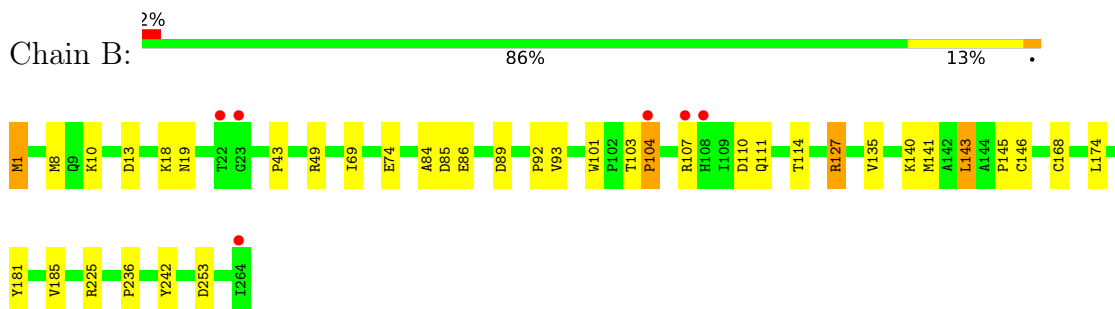
3 Residue-property plots [i](#)

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.

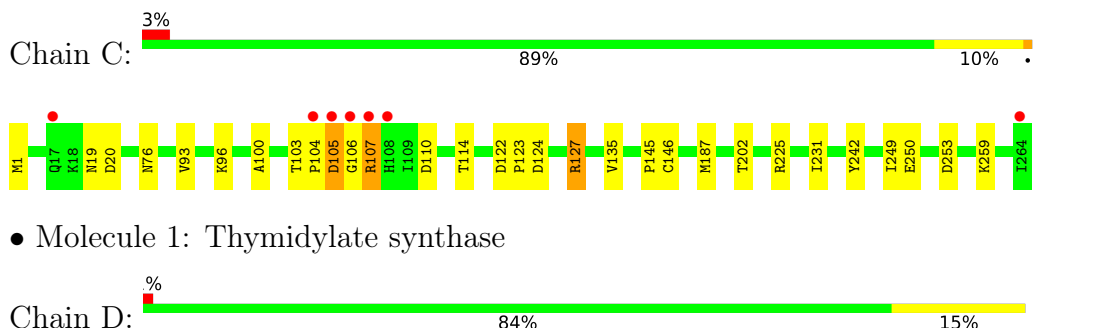
- Molecule 1: Thymidylate synthase



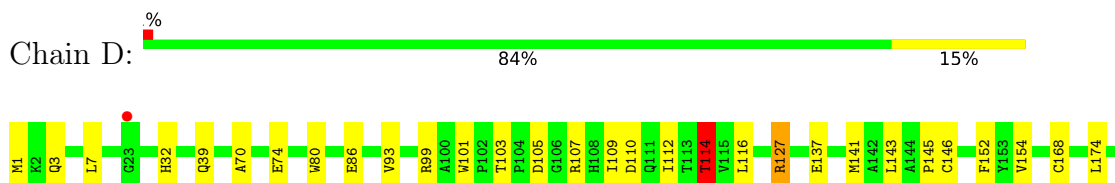
- Molecule 1: Thymidylate synthase



- Molecule 1: Thymidylate synthase

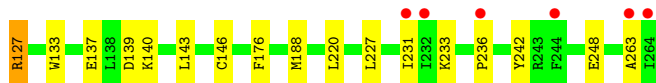
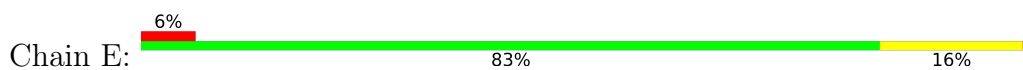


- Molecule 1: Thymidylate synthase

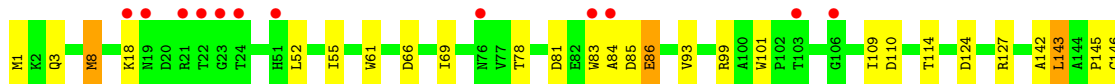
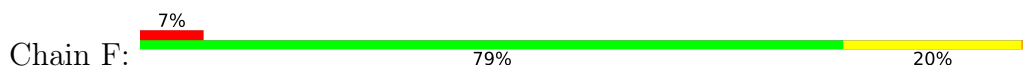




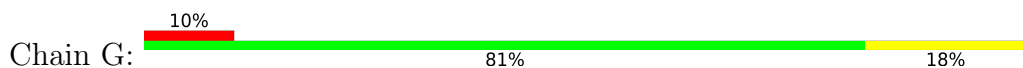
- Molecule 1: Thymidylate synthase



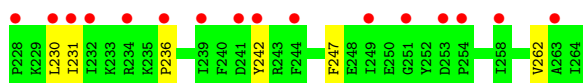
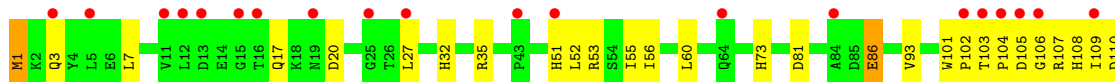
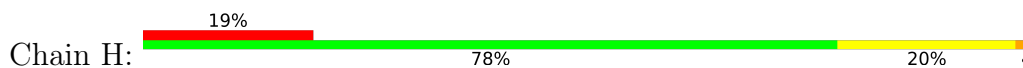
- Molecule 1: Thymidylate synthase



- Molecule 1: Thymidylate synthase



- Molecule 1: Thymidylate synthase



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	95.90Å 85.50Å 134.30Å 90.00° 109.40° 90.00°	Depositor
Resolution (Å)	29.81 – 1.75 29.81 – 1.75	Depositor EDS
% Data completeness (in resolution range)	97.8 (29.81-1.75) 97.9 (29.81-1.75)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.14 (at 1.75Å)	Xtrriage
Refinement program	PHENIX (phenix.refine: 1.7.2_869)	Depositor
R, R_{free}	0.184 , 0.233 0.185 , 0.234	Depositor DCC
R_{free} test set	4020 reflections (2.00%)	wwPDB-VP
Wilson B-factor (Å ²)	20.4	Xtrriage
Anisotropy	0.692	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.42 , 47.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.44$, $\langle L^2 \rangle = 0.26$	Xtrriage
Estimated twinning fraction	0.012 for h,-k,-h-l	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	37528	wwPDB-VP
Average B, all atoms (Å ²)	38.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 38.27 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 3.7798e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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, 1JY, UMC, CXM, UMP

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	0.85	0/2201	0.90	2/2990 (0.1%)
1	B	0.80	0/2213	0.92	1/3004 (0.0%)
1	C	0.78	0/2202	0.90	2/2990 (0.1%)
1	D	0.80	0/2202	0.93	1/2990 (0.0%)
1	E	0.75	0/2202	0.88	0/2990
1	F	0.67	0/2213	0.88	3/3004 (0.1%)
1	G	0.73	0/2202	0.89	2/2990 (0.1%)
1	H	0.63	0/2202	0.90	6/2990 (0.2%)
All	All	0.75	0/17637	0.90	17/23948 (0.1%)

There are no bond length outliers.

The worst 5 of 17 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	255	HIS	CA-C-N	-8.70	111.42	120.03
1	F	255	HIS	C-N-CA	-8.70	111.42	120.03
1	C	106	GLY	N-CA-C	-6.43	106.80	115.36
1	A	24	THR	N-CA-C	5.90	118.95	111.69
1	H	122	ASP	CA-C-N	5.84	125.52	119.56

There are no chirality outliers.

There are no planarity outliers.

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	2152	2091	2080	33	0
1	B	2161	2102	2093	38	0
1	C	2153	2086	2080	25	0
1	D	2153	2090	2080	31	0
1	E	2153	2089	2079	46	0
1	F	2161	2102	2092	39	0
1	G	2153	2086	2080	38	0
1	H	2153	2089	2079	45	0
2	A	20	11	11	1	0
2	C	20	11	11	2	0
2	G	20	11	11	1	0
3	A	1	0	0	0	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	G	1	0	0	0	0
3	H	1	0	0	0	0
4	A	47	0	30	5	0
4	B	47	0	30	4	0
4	C	47	0	30	5	0
4	D	47	0	30	6	0
4	E	47	0	30	15	0
4	F	47	0	30	5	0
4	G	47	0	30	5	0
4	H	47	0	30	8	0
5	B	20	12	13	3	0
5	D	20	12	13	5	0
5	E	20	12	12	2	0
5	F	20	12	12	3	0
5	H	20	12	12	2	0
6	A	184	356	0	3	0
6	B	169	326	0	12	0
6	C	168	324	0	2	0
6	D	131	250	0	3	0
6	E	129	248	0	8	0
6	F	92	184	0	5	0
6	G	74	136	0	3	0
6	H	53	94	0	2	0
All	All	18782	18746	16998	315	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 9.

The worst 5 of 315 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:146[A]:CYS:SG	5:B:301:UMC:H6	1.14	1.72
1:D:146:CYS:SG	5:D:301:UMC:H6	1.16	1.63
1:F:146:CYS:SG	5:F:301:UMC:C6	2.02	1.48
1:E:146:CYS:SG	5:E:301:UMC:C6	2.03	1.47
1:H:146:CYS:SG	5:H:301:UMC:C6	2.05	1.43

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	262/264 (99%)	256 (98%)	5 (2%)	1 (0%)	30 15
1	B	263/264 (100%)	256 (97%)	5 (2%)	2 (1%)	16 5
1	C	262/264 (99%)	253 (97%)	7 (3%)	2 (1%)	16 5
1	D	262/264 (99%)	254 (97%)	7 (3%)	1 (0%)	30 15
1	E	262/264 (99%)	254 (97%)	7 (3%)	1 (0%)	30 15
1	F	263/264 (100%)	253 (96%)	9 (3%)	1 (0%)	30 15
1	G	262/264 (99%)	249 (95%)	10 (4%)	3 (1%)	11 2
1	H	262/264 (99%)	250 (95%)	11 (4%)	1 (0%)	30 15
All	All	2098/2112 (99%)	2025 (96%)	61 (3%)	12 (1%)	21 8

5 of 12 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	104	PRO
1	C	105	ASP
1	G	105	ASP

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Mol	Chain	Res	Type
1	D	93	VAL
1	G	13	ASP

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	232/232 (100%)	226 (97%)	6 (3%)	40 20
1	B	233/232 (100%)	229 (98%)	4 (2%)	53 36
1	C	232/232 (100%)	229 (99%)	3 (1%)	61 46
1	D	232/232 (100%)	226 (97%)	6 (3%)	40 20
1	E	232/232 (100%)	229 (99%)	3 (1%)	61 46
1	F	233/232 (100%)	228 (98%)	5 (2%)	47 27
1	G	232/232 (100%)	227 (98%)	5 (2%)	45 26
1	H	232/232 (100%)	227 (98%)	5 (2%)	45 26
All	All	1858/1856 (100%)	1821 (98%)	37 (2%)	50 29

5 of 37 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	G	20	ASP
1	H	129	ILE
1	G	105	ASP
1	H	17	GLN
1	C	127	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 15 such sidechains are listed below:

Mol	Chain	Res	Type
1	G	9	GLN
1	H	186	HIS
1	G	33	GLN

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Mol	Chain	Res	Type
1	H	217	HIS
1	H	134	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

8 non-standard protein/DNA/RNA residues 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
1	CXM	E	1	1	9,10,11	0.86	0	9,11,13	1.82	1 (11%)
1	CXM	G	1	1	9,10,11	1.11	0	9,11,13	2.06	2 (22%)
1	CXM	D	1	1	9,10,11	0.94	0	9,11,13	1.60	1 (11%)
1	CXM	H	1	1	9,10,11	0.96	0	9,11,13	1.13	1 (11%)
1	CXM	F	1	1	9,10,11	0.85	0	9,11,13	1.74	1 (11%)
1	CXM	A	1	1	9,10,11	1.02	0	9,11,13	1.47	2 (22%)
1	CXM	B	1	1	9,10,11	2.17	2 (22%)	9,11,13	1.57	1 (11%)
1	CXM	C	1	1	9,10,11	1.11	1 (11%)	9,11,13	1.17	1 (11%)

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
1	CXM	E	1	1	-	1/9/10/12	-
1	CXM	G	1	1	-	6/9/10/12	-
1	CXM	D	1	1	-	1/9/10/12	-
1	CXM	H	1	1	-	2/9/10/12	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	CXM	F	1	1	-	1/9/10/12	-
1	CXM	A	1	1	-	0/9/10/12	-
1	CXM	B	1	1	-	2/9/10/12	-
1	CXM	C	1	1	-	1/9/10/12	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	1	CXM	CE-SD	-5.77	1.43	1.78
1	B	1	CXM	ON1-CN	2.40	1.26	1.21
1	C	1	CXM	ON1-CN	2.16	1.25	1.21

The worst 5 of 10 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	G	1	CXM	ON1-CN-N	-4.81	116.97	124.86
1	E	1	CXM	ON1-CN-N	-4.72	117.12	124.86
1	F	1	CXM	ON1-CN-N	-4.72	117.12	124.86
1	D	1	CXM	ON1-CN-N	-3.88	118.49	124.86
1	B	1	CXM	ON1-CN-N	-3.54	119.05	124.86

There are no chirality outliers.

5 of 14 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	C	1	CXM	O-C-CA-CB
1	G	1	CXM	C-CA-N-CN
1	G	1	CXM	ON1-CN-N-CA
1	H	1	CXM	O-C-CA-CB
1	G	1	CXM	CB-CG-SD-CE

There are no ring outliers.

4 monomers are involved in 11 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	E	1	CXM	1	0
1	H	1	CXM	1	0
1	A	1	CXM	6	0
1	B	1	CXM	3	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 23 ligands modelled in this entry, 7 are monoatomic - leaving 16 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	UMP	C	301	-	21,21,21	1.05	0	30,31,31	1.52	6 (20%)
4	1JY	A	303	-	48,50,50	1.35	5 (10%)	61,70,70	1.56	12 (19%)
4	1JY	G	303	-	48,50,50	1.54	6 (12%)	61,70,70	1.54	10 (16%)
4	1JY	F	302	-	48,50,50	1.41	6 (12%)	61,70,70	1.51	9 (14%)
5	UMC	B	301	-	20,21,21	1.08	3 (15%)	25,31,31	1.84	6 (24%)
5	UMC	D	301	-	20,21,21	1.05	2 (10%)	25,31,31	1.63	3 (12%)
5	UMC	F	301	-	20,21,21	1.03	2 (10%)	25,31,31	1.87	3 (12%)
5	UMC	E	301	-	20,21,21	1.16	1 (5%)	25,31,31	1.60	3 (12%)
4	1JY	C	303	-	48,50,50	1.35	6 (12%)	61,70,70	1.64	13 (21%)
4	1JY	E	303	-	48,50,50	1.39	5 (10%)	61,70,70	1.54	11 (18%)
4	1JY	D	303	-	48,50,50	1.42	4 (8%)	61,70,70	1.75	11 (18%)
4	1JY	B	303	-	48,50,50	1.33	5 (10%)	61,70,70	1.64	12 (19%)
2	UMP	G	301	-	21,21,21	0.86	0	30,31,31	1.39	4 (13%)
2	UMP	A	301	-	21,21,21	0.96	1 (4%)	30,31,31	1.79	6 (20%)
4	1JY	H	303	-	48,50,50	1.34	5 (10%)	61,70,70	1.48	8 (13%)
5	UMC	H	301	-	20,21,21	0.94	1 (5%)	25,31,31	1.67	4 (16%)

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	UMP	C	301	-	-	1/10/22/22	0/2/2/2
4	1JY	A	303	-	-	3/40/52/52	0/4/4/4
4	1JY	G	303	-	-	4/40/52/52	0/4/4/4
4	1JY	F	302	-	-	1/40/52/52	0/4/4/4
5	UMC	B	301	-	-	0/10/35/35	0/2/2/2
5	UMC	D	301	-	-	0/10/35/35	0/2/2/2
5	UMC	F	301	-	-	1/10/35/35	0/2/2/2
5	UMC	E	301	-	-	1/10/35/35	0/2/2/2
4	1JY	C	303	-	-	5/40/52/52	0/4/4/4
4	1JY	E	303	-	-	6/40/52/52	0/4/4/4
4	1JY	D	303	-	-	4/40/52/52	0/4/4/4
4	1JY	B	303	-	-	3/40/52/52	0/4/4/4
2	UMP	G	301	-	-	0/10/22/22	0/2/2/2
2	UMP	A	301	-	-	0/10/22/22	0/2/2/2
4	1JY	H	303	-	-	13/40/52/52	0/4/4/4
5	UMC	H	301	-	-	2/10/35/35	0/2/2/2

The worst 5 of 52 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	G	303	1JY	CBR-CBI	-5.03	1.39	1.48
4	E	303	1JY	CBR-CBI	-4.87	1.39	1.48
4	F	302	1JY	CBR-CBI	-4.84	1.39	1.48
4	D	303	1JY	CBR-CBI	-4.81	1.40	1.48
4	H	303	1JY	CBR-CBI	-4.62	1.40	1.48

The worst 5 of 121 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	303	1JY	CAL-CAU-NBU	-7.19	102.28	112.92
5	F	301	UMC	C2'-C1'-N1	-6.73	107.59	115.59
4	H	303	1JY	CAL-CAU-NBU	-5.68	104.51	112.92
2	A	301	UMP	C4-N3-C2	-5.35	119.98	126.61
5	E	301	UMC	C2'-C1'-N1	-5.21	109.40	115.59

There are no chirality outliers.

5 of 44 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	C	303	1JY	CBN-CBO-NBU-CBQ
4	D	303	1JY	CBN-CBO-NBU-CBQ

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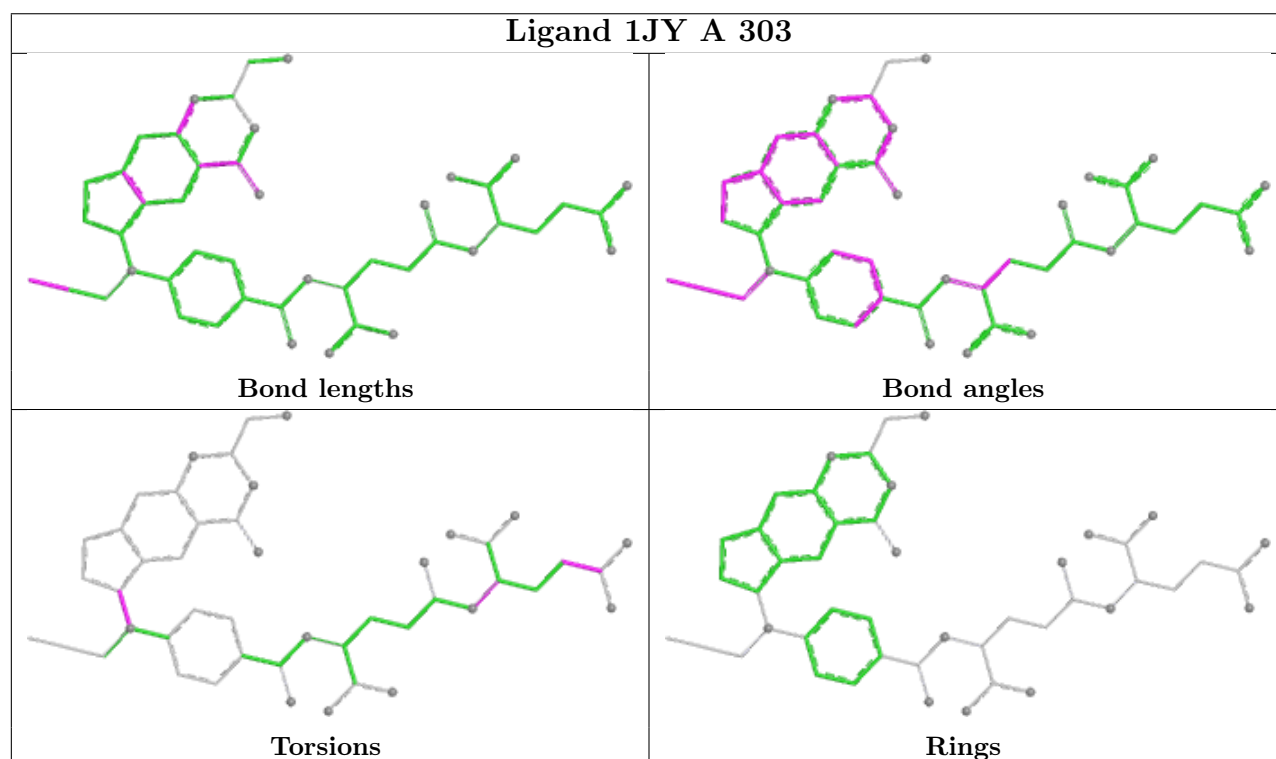
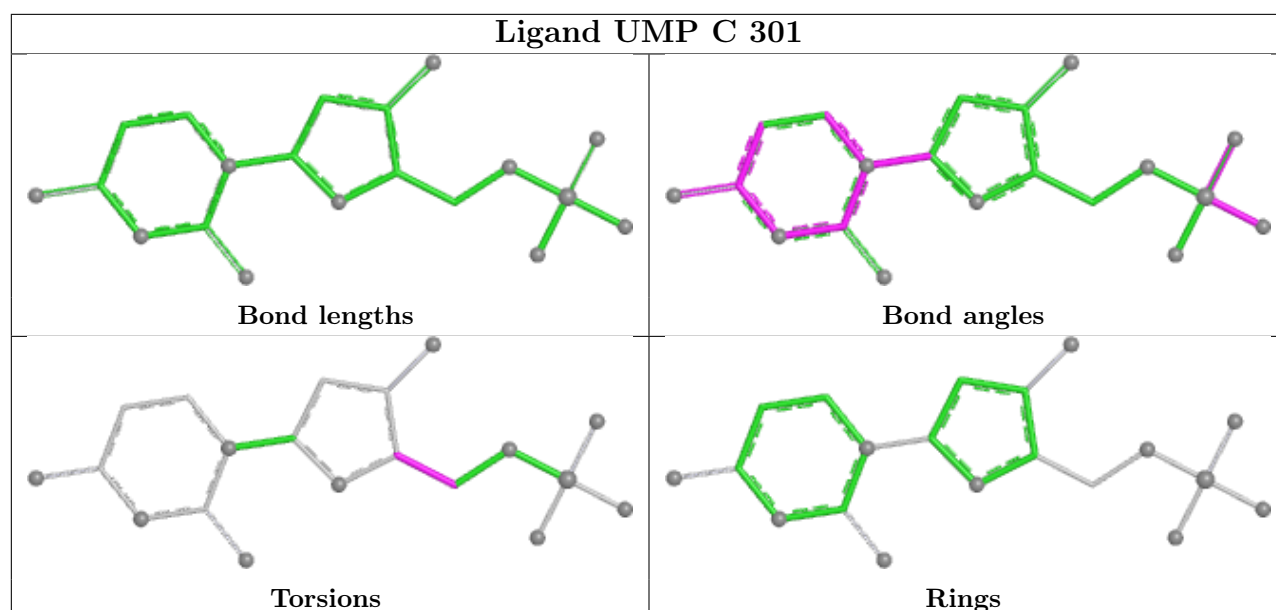
Mol	Chain	Res	Type	Atoms
4	E	303	1JY	CBN-CBO-NBU-CBQ
4	G	303	1JY	CBN-CBO-NBU-CBQ
4	G	303	1JY	N-CA-CB-CG

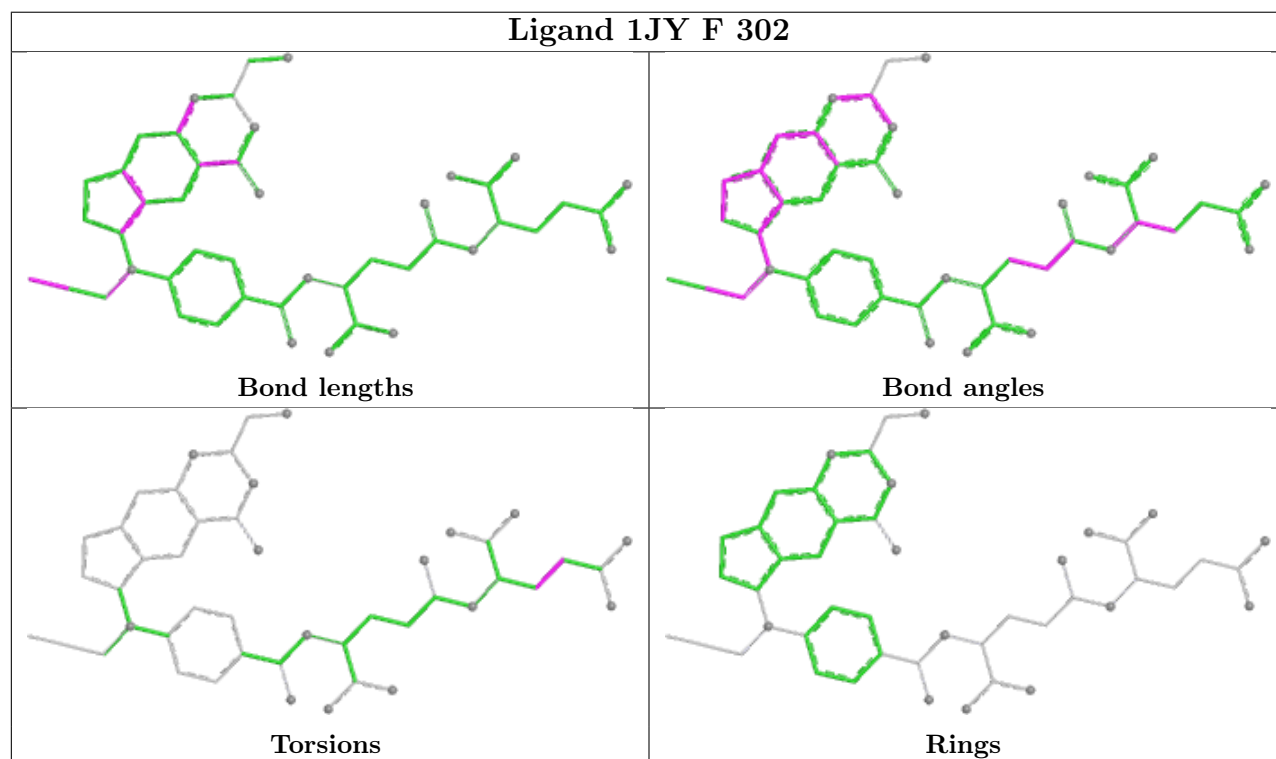
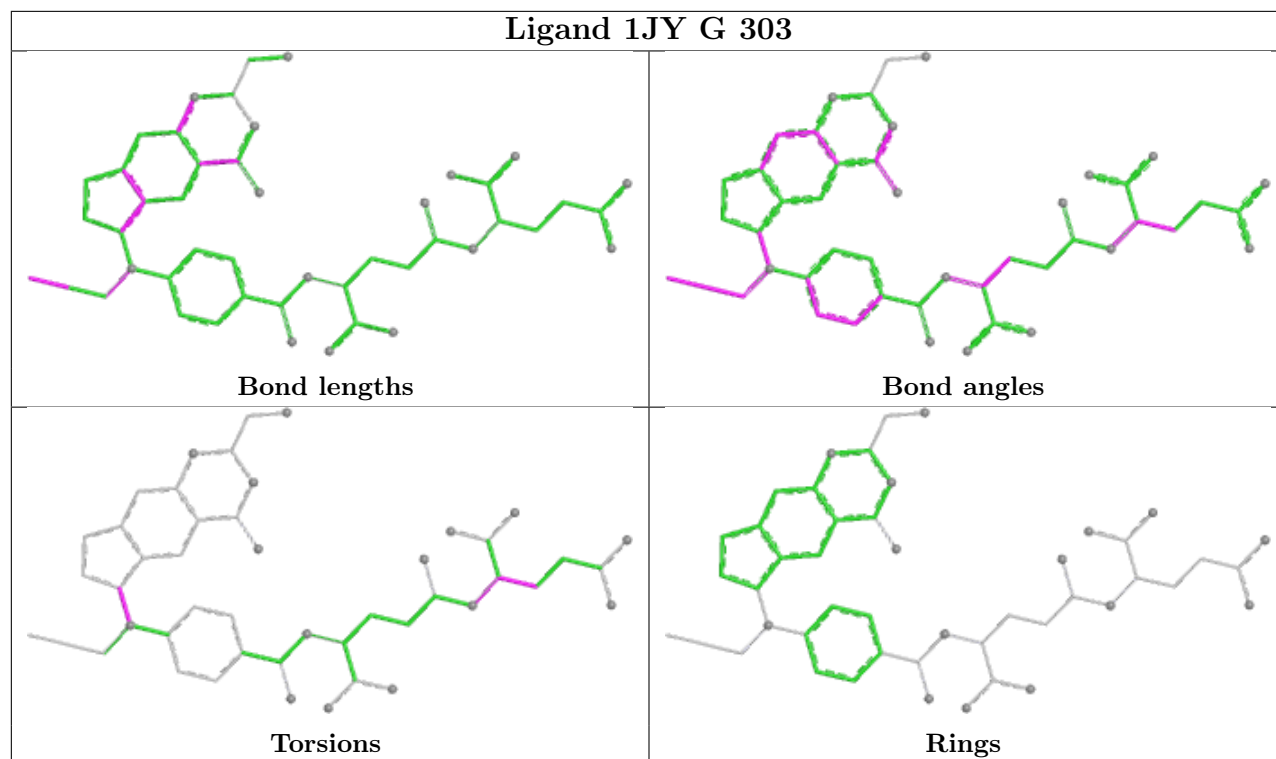
There are no ring outliers.

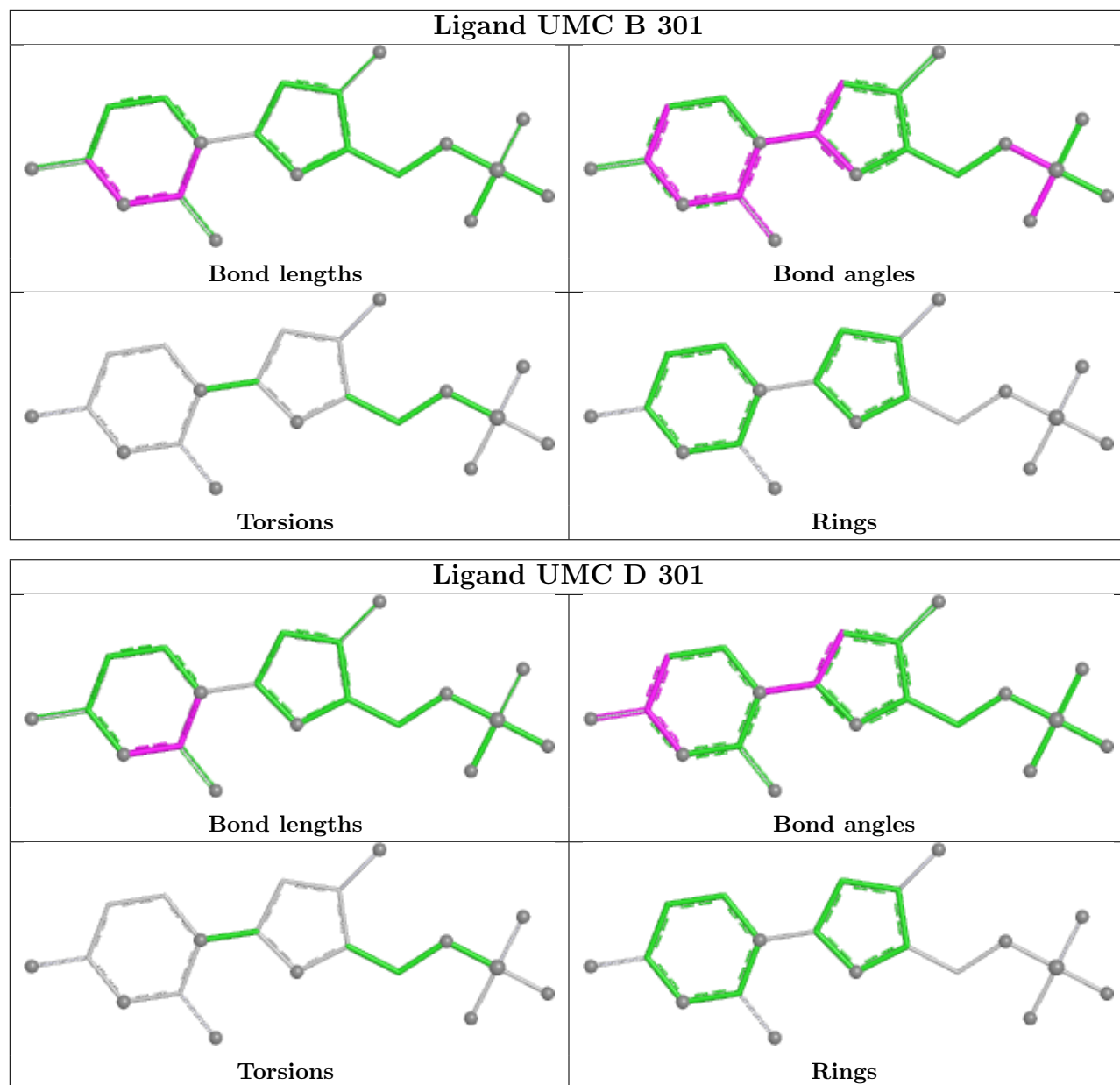
16 monomers are involved in 72 short contacts:

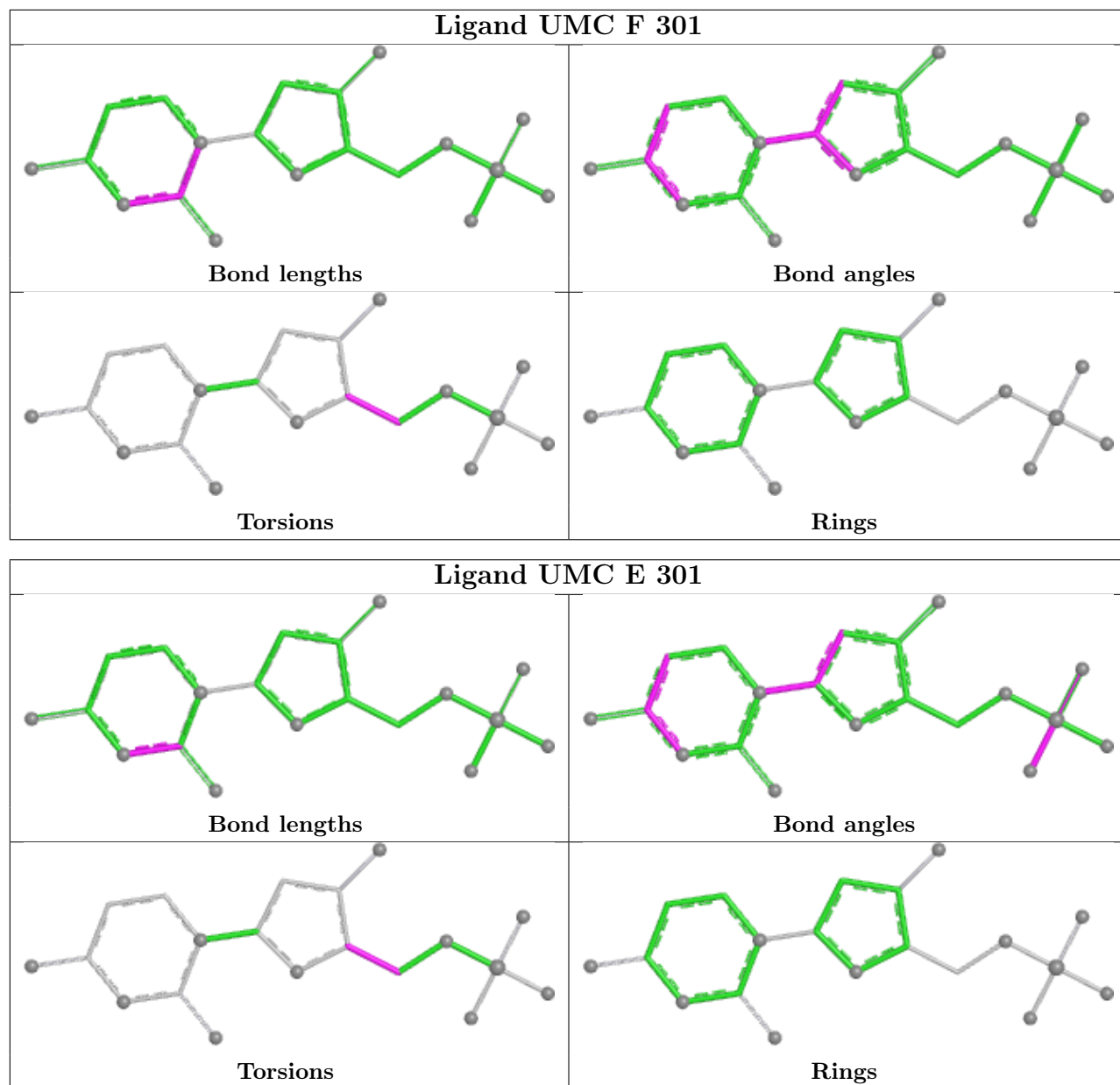
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	301	UMP	2	0
4	A	303	1JY	5	0
4	G	303	1JY	5	0
4	F	302	1JY	5	0
5	B	301	UMC	3	0
5	D	301	UMC	5	0
5	F	301	UMC	3	0
5	E	301	UMC	2	0
4	C	303	1JY	5	0
4	E	303	1JY	15	0
4	D	303	1JY	6	0
4	B	303	1JY	4	0
2	G	301	UMP	1	0
2	A	301	UMP	1	0
4	H	303	1JY	8	0
5	H	301	UMC	2	0

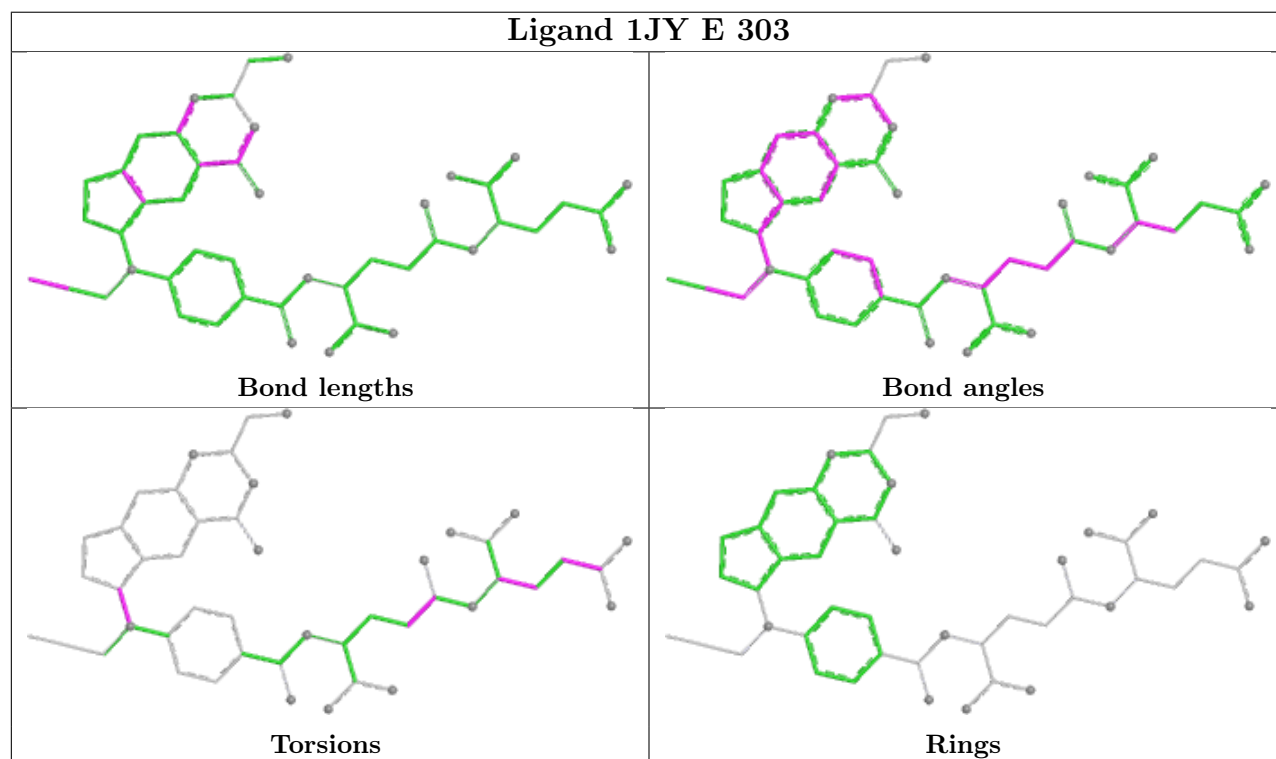
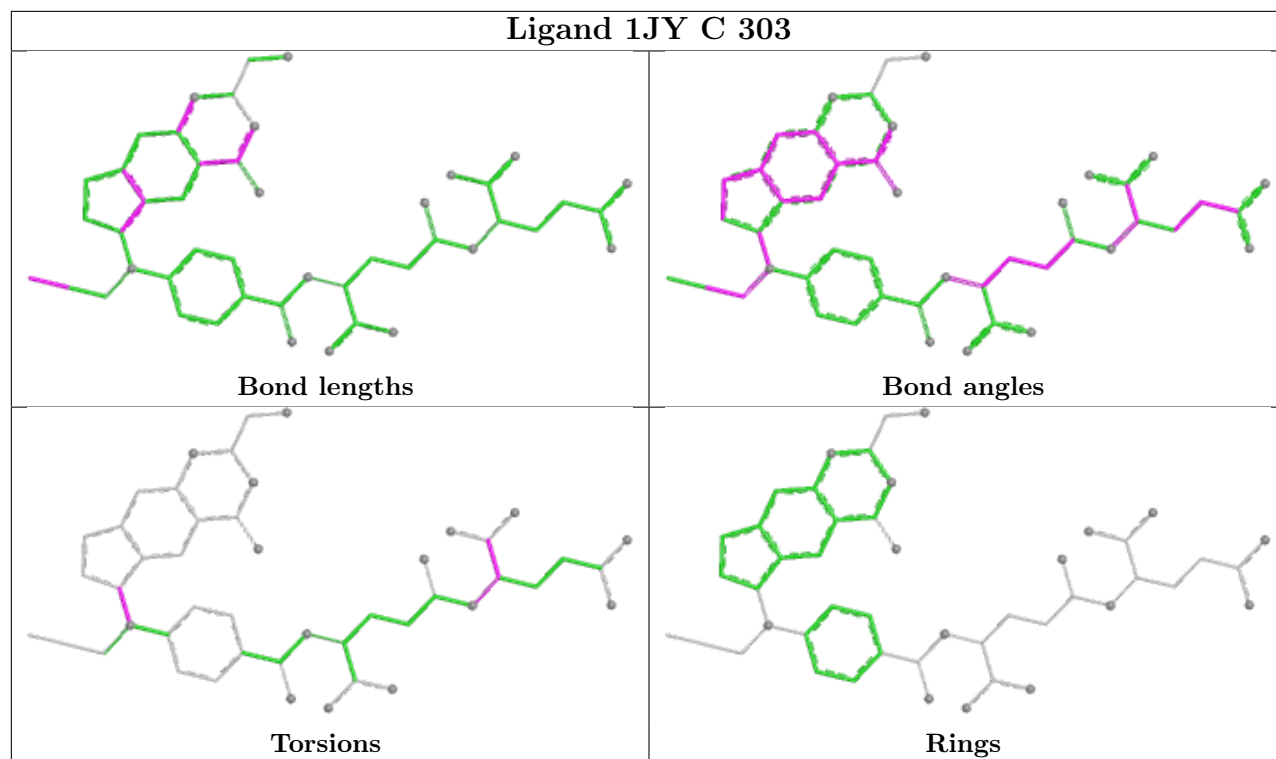
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

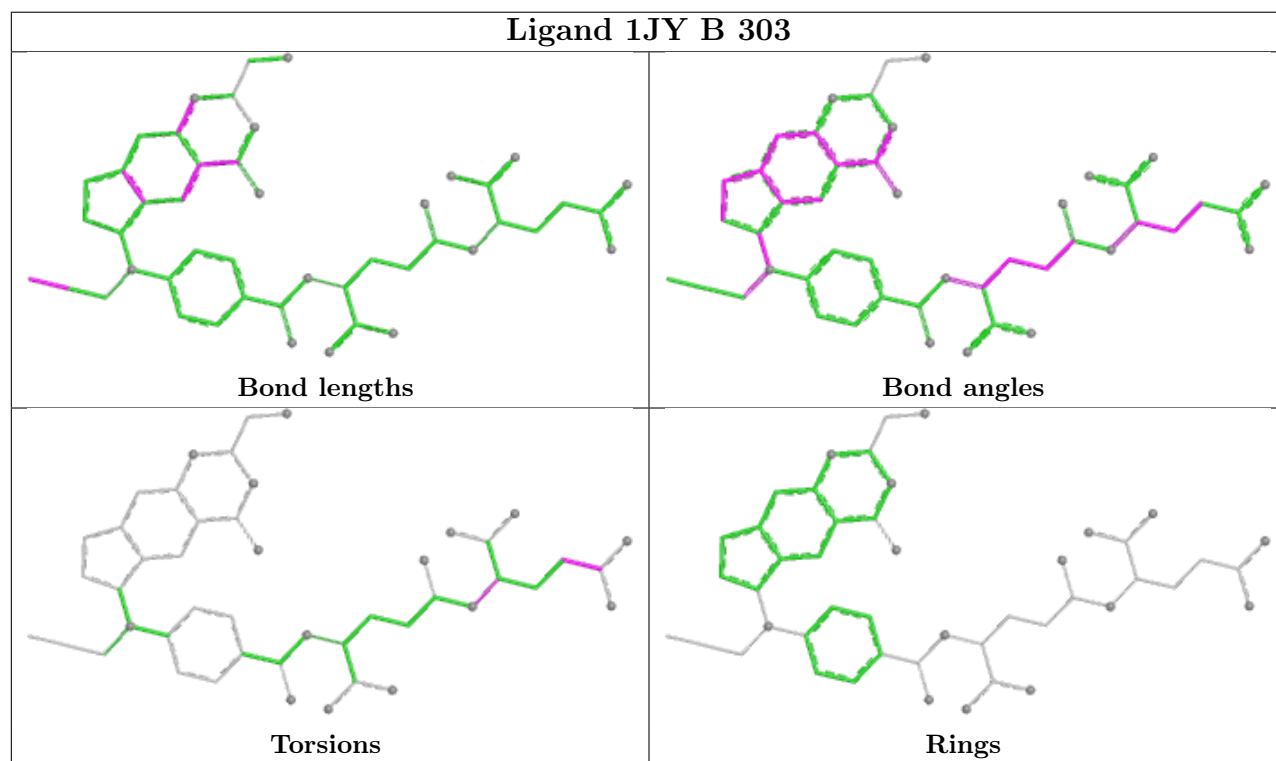
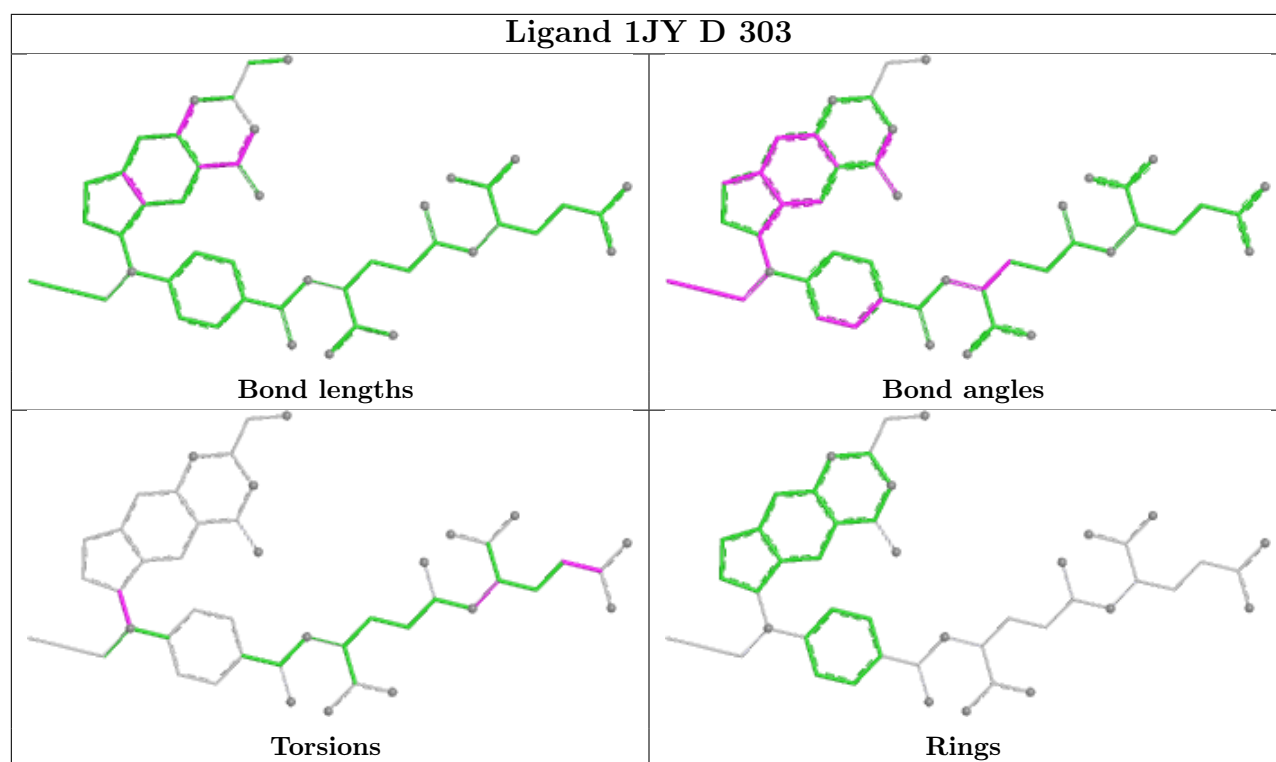


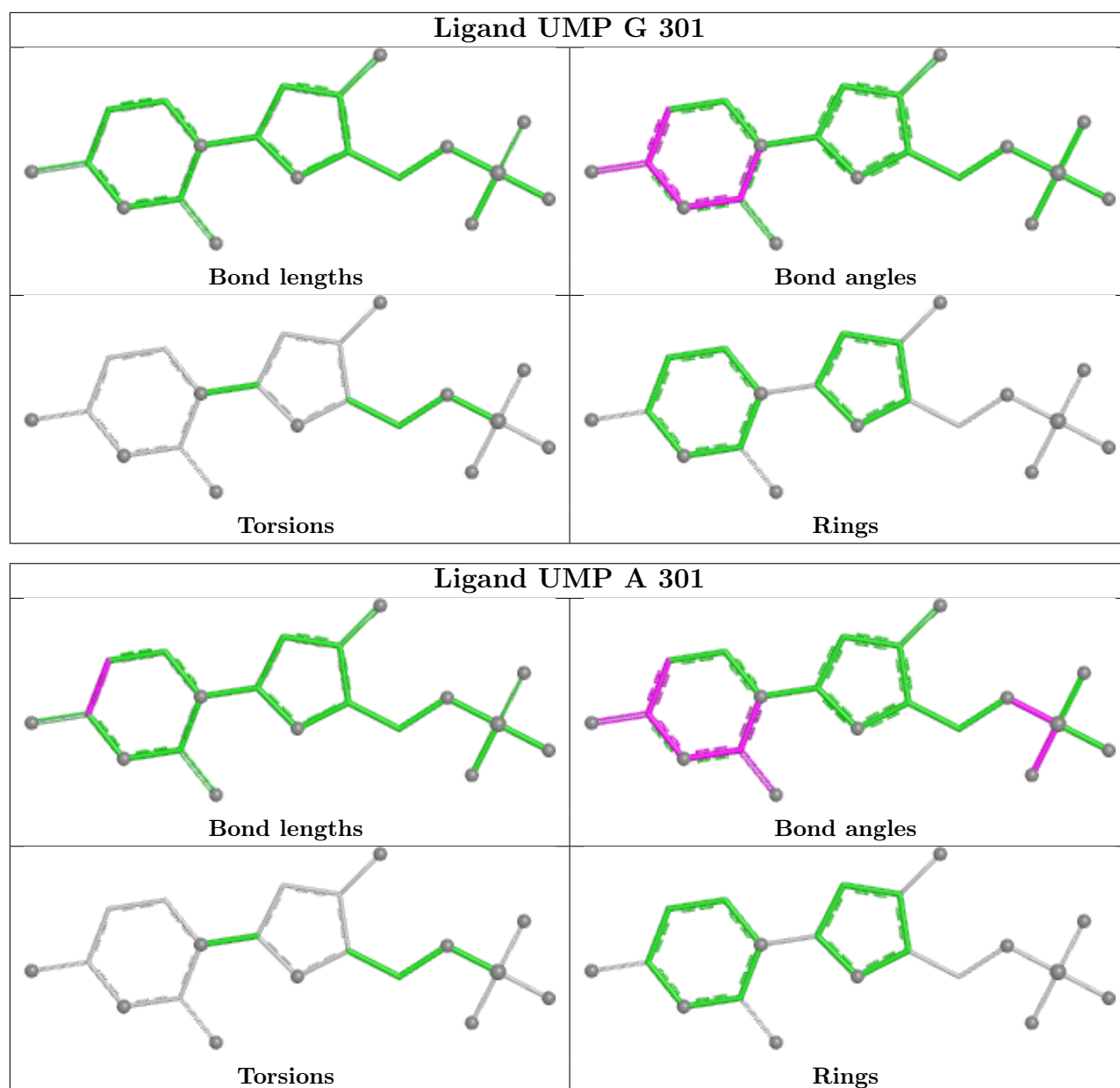


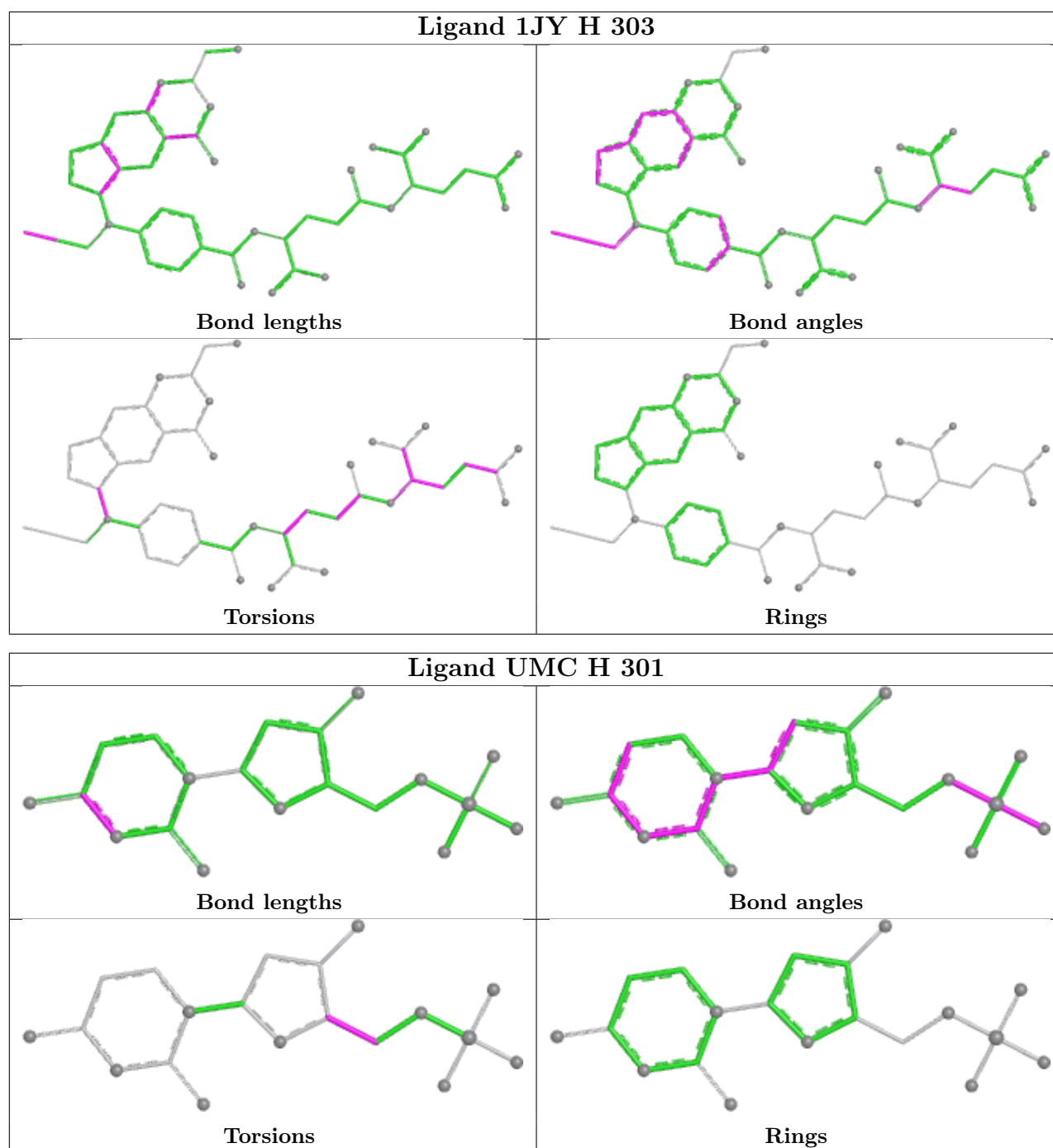












5.7 Other polymers [\(i\)](#)

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	261/264 (98%)	0.13	8 (3%) 51 58	15, 28, 52, 92	0
1	B	263/264 (99%)	0.10	6 (2%) 61 67	15, 29, 51, 85	1 (0%)
1	C	263/264 (99%)	0.10	7 (2%) 56 62	17, 30, 50, 95	2 (0%)
1	D	263/264 (99%)	0.24	2 (0%) 82 86	15, 32, 56, 77	0
1	E	263/264 (99%)	0.65	17 (6%) 25 29	16, 35, 68, 88	0
1	F	261/264 (98%)	0.60	18 (6%) 23 26	15, 39, 71, 106	1 (0%)
1	G	262/264 (99%)	0.97	26 (9%) 13 15	22, 43, 68, 107	1 (0%)
1	H	254/264 (96%)	1.25	51 (20%) 3 3	25, 49, 68, 109	0
All	All	2090/2112 (98%)	0.50	135 (6%) 25 29	15, 35, 63, 109	5 (0%)

The worst 5 of 135 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	264	ILE	5.3
1	F	264	ILE	5.2
1	G	104	PRO	5.0
1	B	264	ILE	4.7
1	C	104	PRO	4.4

6.2 Non-standard residues in protein, DNA, RNA chains [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(Å ²)	Q<0.9
1	CXM	H	1	11/12	0.88	0.15	27,46,97,97	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
1	CXM	G	1	11/12	0.93	0.12	26,40,58,58	0
1	CXM	F	1	11/12	0.95	0.08	22,29,49,49	0
1	CXM	D	1	11/12	0.95	0.08	19,31,41,41	0
1	CXM	E	1	11/12	0.95	0.07	17,27,39,39	0
1	CXM	B	1	11/12	0.96	0.07	12,23,56,56	0
1	CXM	A	1	11/12	0.96	0.09	17,26,75,75	0
1	CXM	C	1	11/12	0.98	0.06	17,27,36,36	0

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.

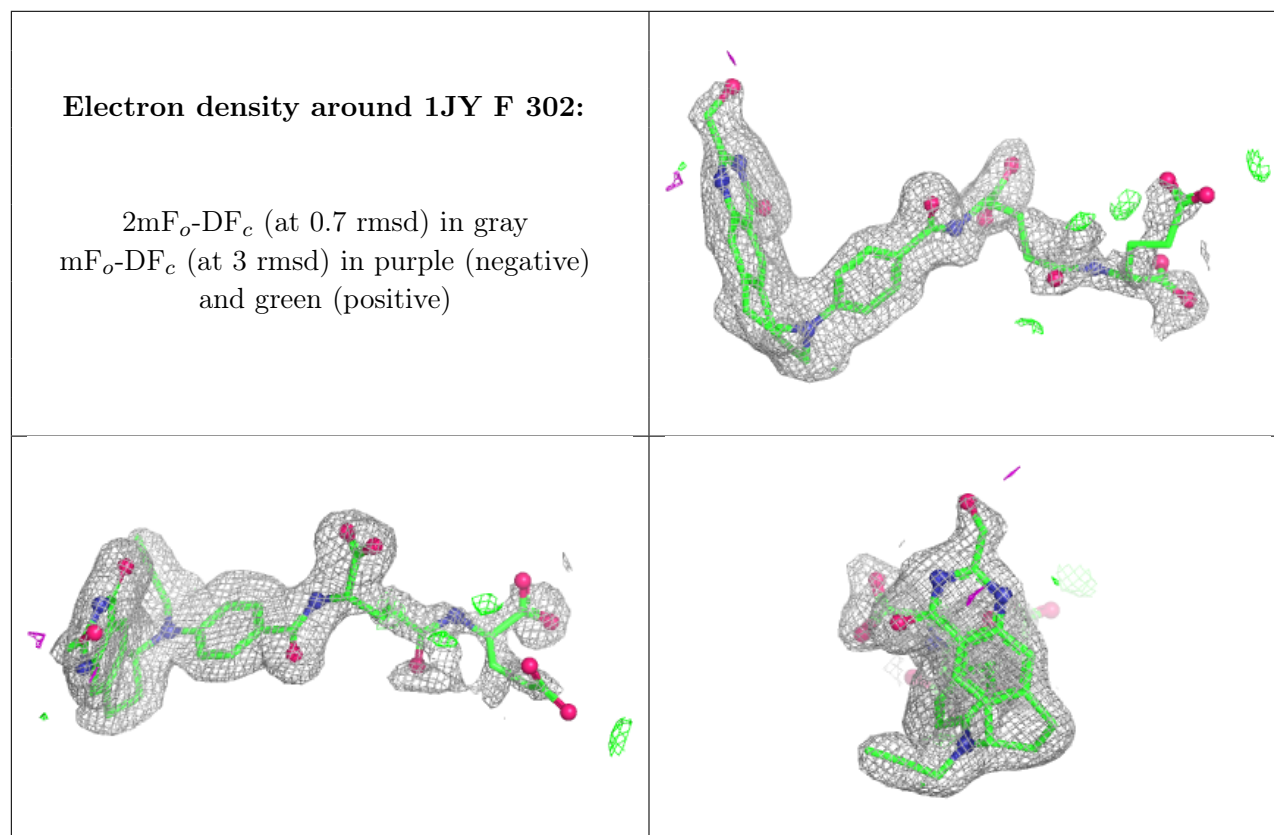
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
4	1JY	F	302	47/47	0.89	0.14	24,38,103,107	0
4	1JY	G	303	47/47	0.90	0.11	13,29,60,62	0
4	1JY	E	303	47/47	0.91	0.13	18,32,79,84	0
4	1JY	H	303	47/47	0.92	0.12	18,34,98,104	0
2	UMP	G	301	20/20	0.93	0.09	16,28,39,47	0
4	1JY	A	303	47/47	0.93	0.09	14,23,42,59	0
4	1JY	B	303	47/47	0.93	0.10	14,22,56,70	0
4	1JY	C	303	47/47	0.93	0.09	10,23,42,54	0
5	UMC	H	301	20/20	0.93	0.09	22,30,37,37	0
4	1JY	D	303	47/47	0.94	0.09	16,24,45,61	0
5	UMC	E	301	20/20	0.95	0.07	19,26,33,39	0
5	UMC	F	301	20/20	0.96	0.07	22,29,34,37	0
2	UMP	A	301	20/20	0.96	0.06	15,23,29,33	0
2	UMP	C	301	20/20	0.97	0.06	14,21,29,32	0
5	UMC	B	301	20/20	0.97	0.06	18,24,30,31	0
5	UMC	D	301	20/20	0.97	0.06	11,22,29,35	0
3	MG	G	302	1/1	0.98	0.03	33,33,33,33	0
3	MG	H	302	1/1	0.98	0.04	36,36,36,36	0
3	MG	A	302	1/1	0.98	0.04	24,24,24,24	0
3	MG	D	302	1/1	0.98	0.04	28,28,28,28	0
3	MG	E	302	1/1	0.98	0.04	39,39,39,39	0

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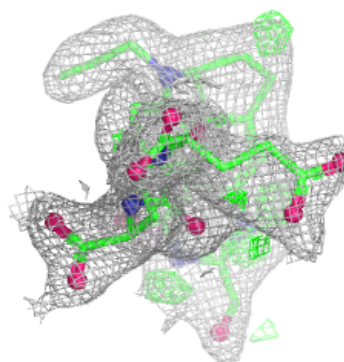
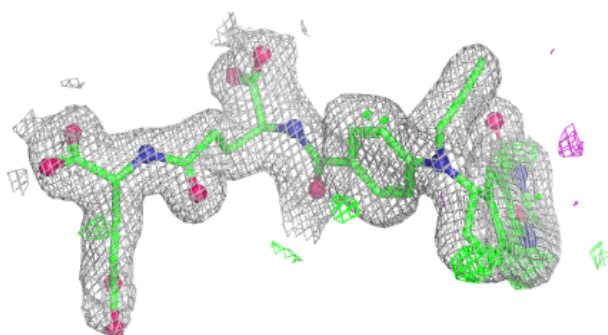
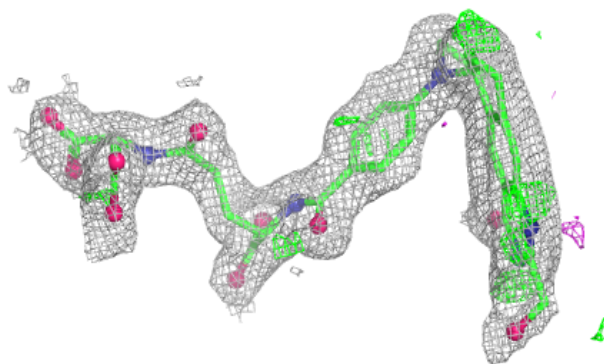
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
3	MG	C	302	1/1	0.99	0.03	24,24,24,24	0
3	MG	B	302	1/1	0.99	0.03	26,26,26,26	0

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.

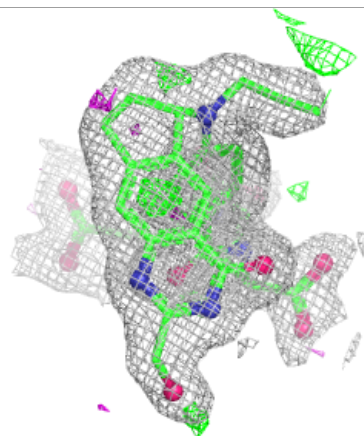
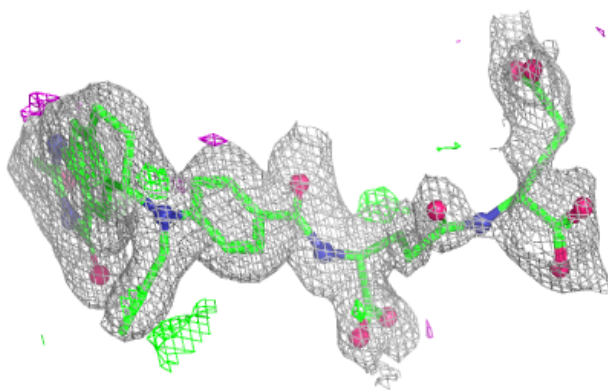
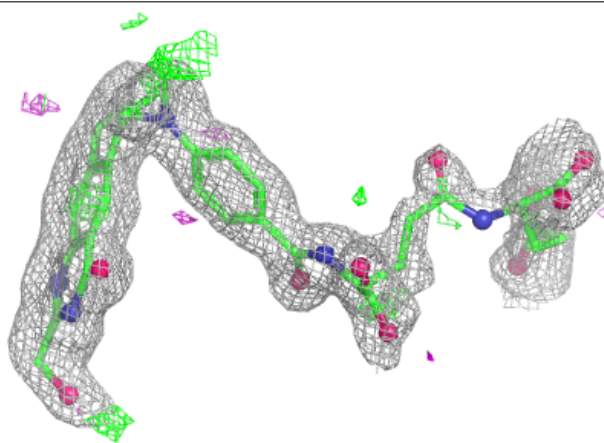


Electron density around 1JY G 303:

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

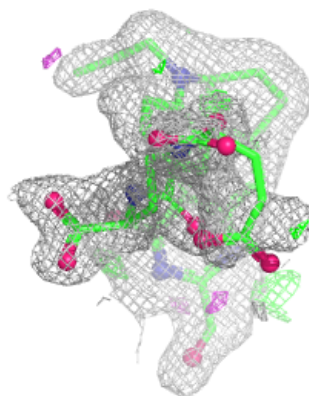
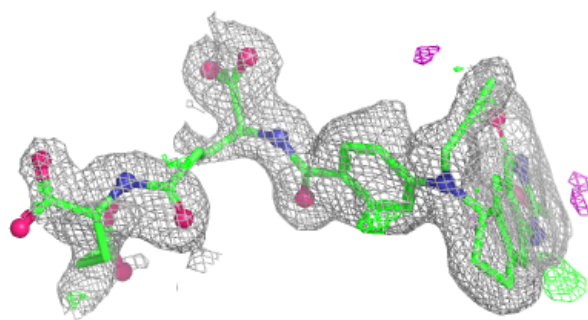
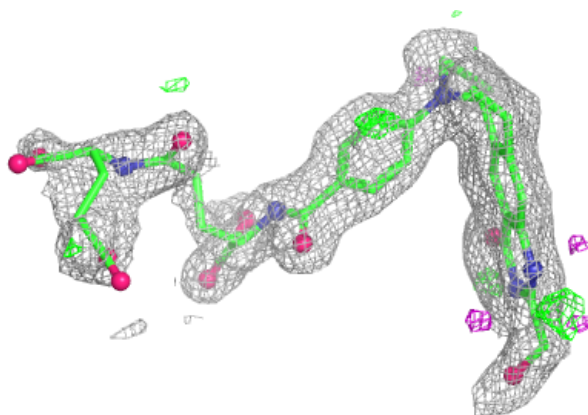
**Electron density around 1JY E 303:**

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



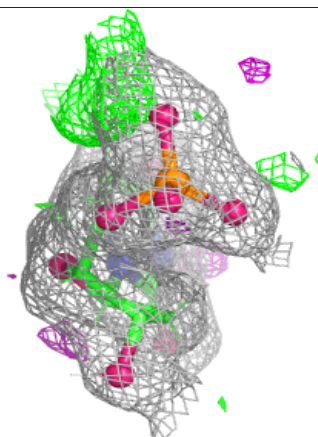
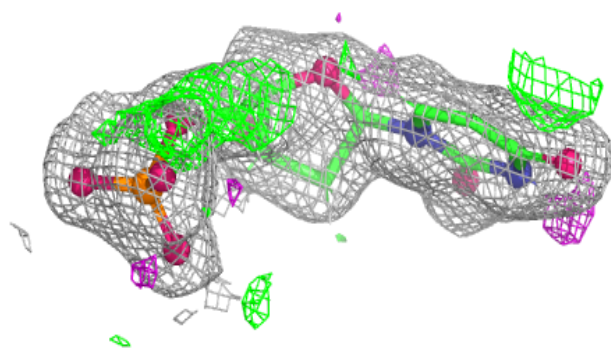
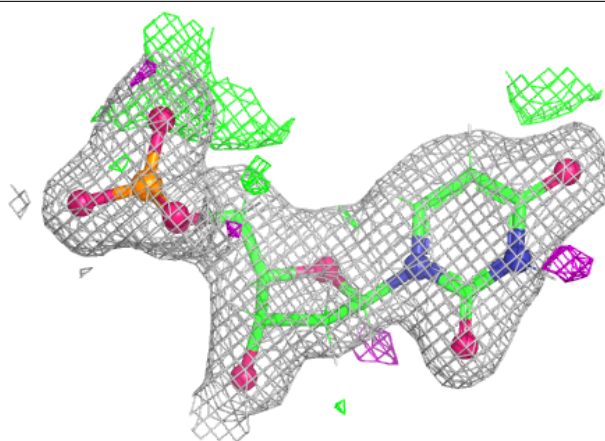
Electron density around 1JY H 303:

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

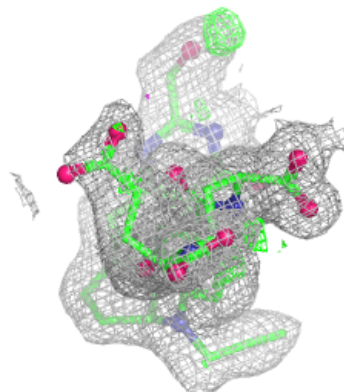
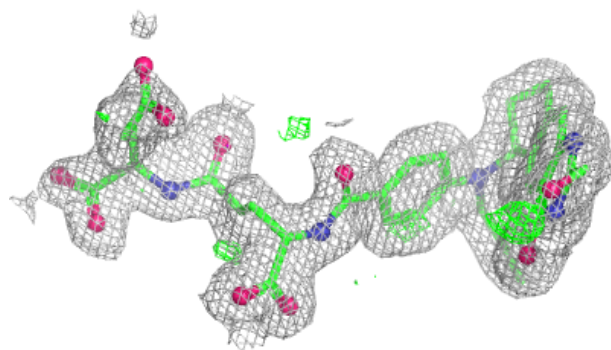
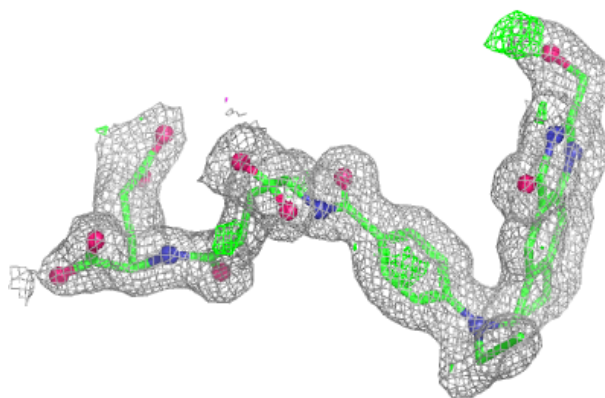


Electron density around UMP G 301:

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and green (positive)

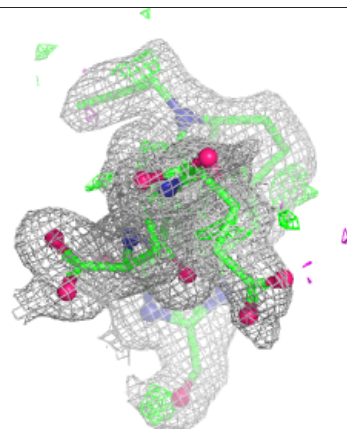
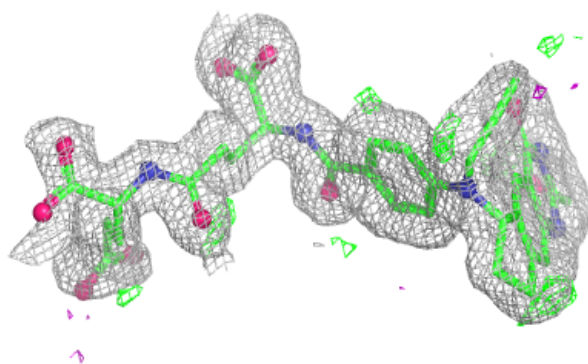
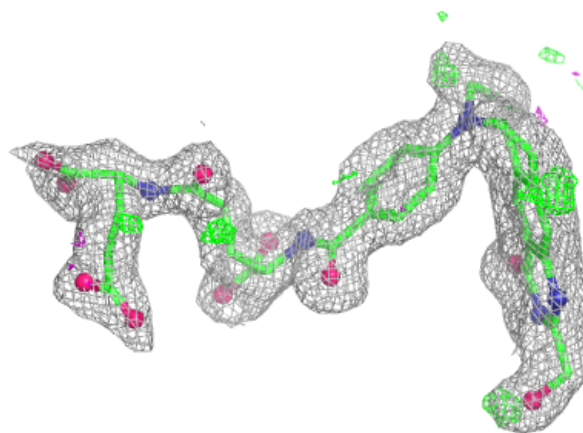
**Electron density around 1JY A 303:**

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

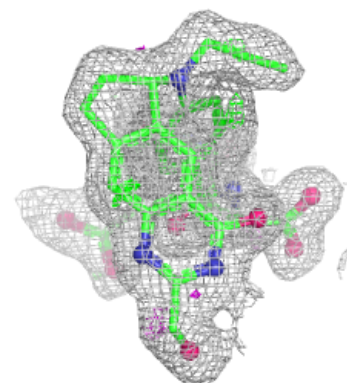
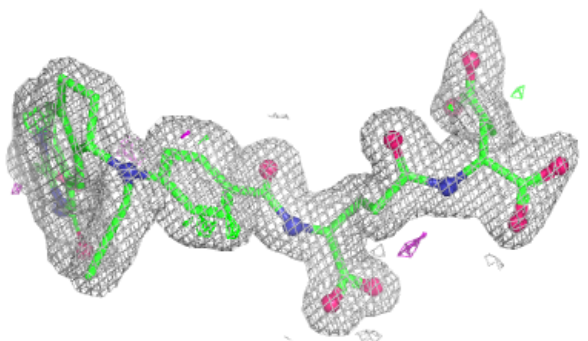
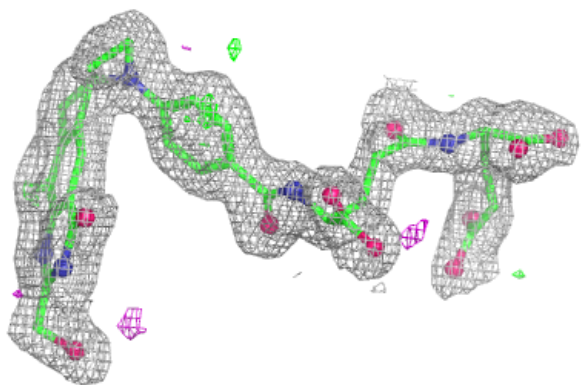


Electron density around 1JY B 303:

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

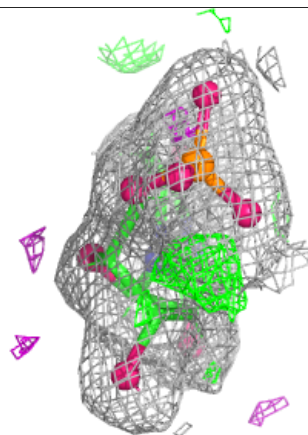
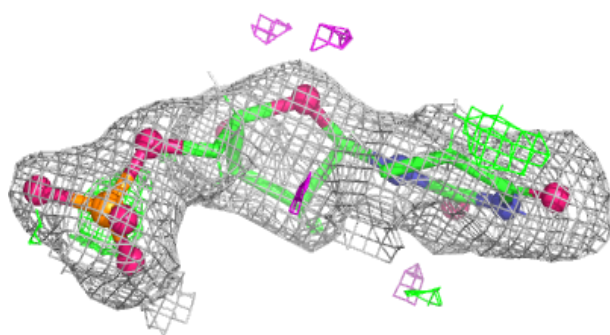
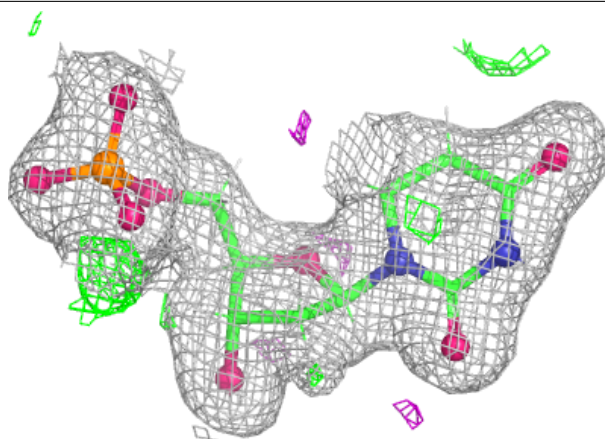
**Electron density around 1JY C 303:**

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

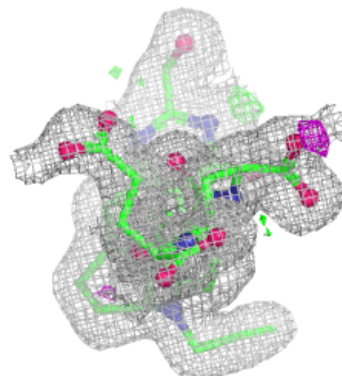
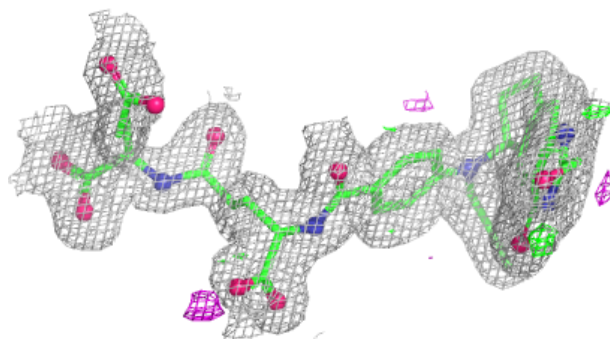
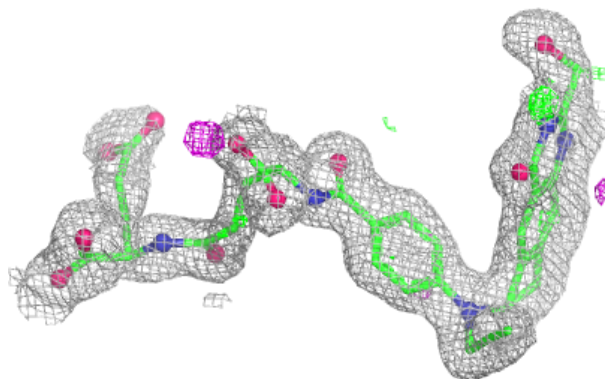


Electron density around UMC H 301:

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

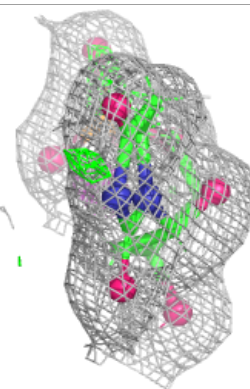
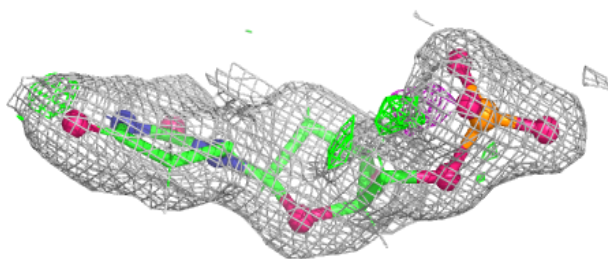
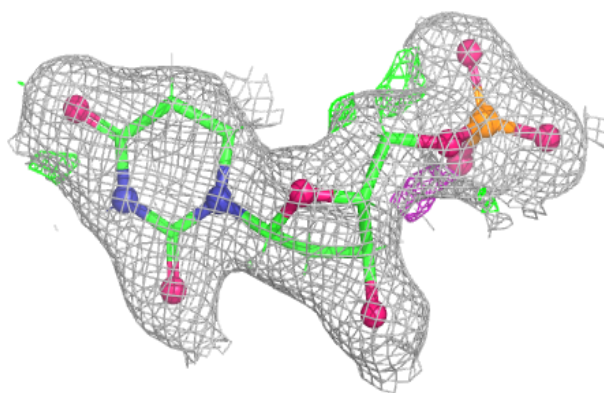
**Electron density around 1JY D 303:**

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

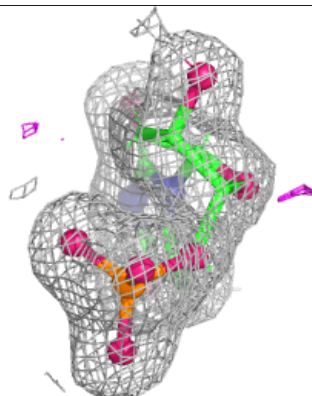
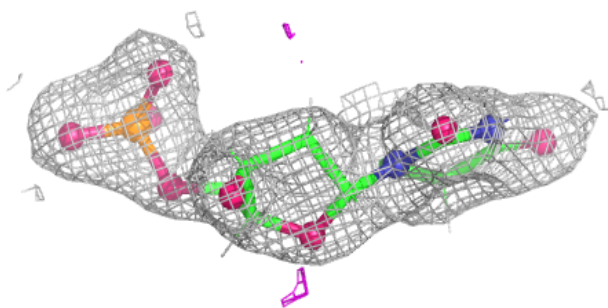
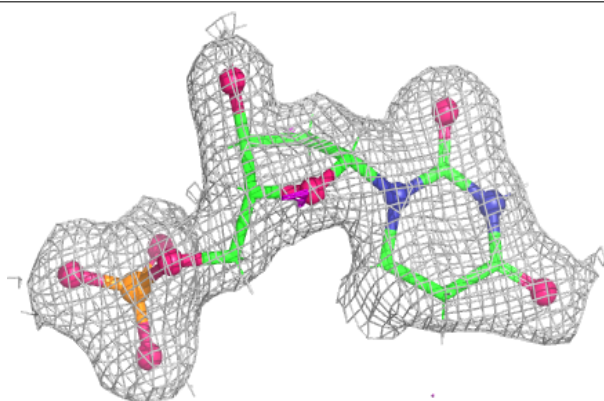


Electron density around UMC E 301:

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

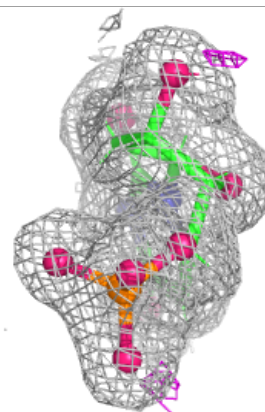
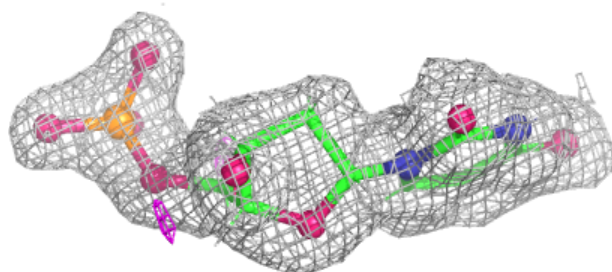
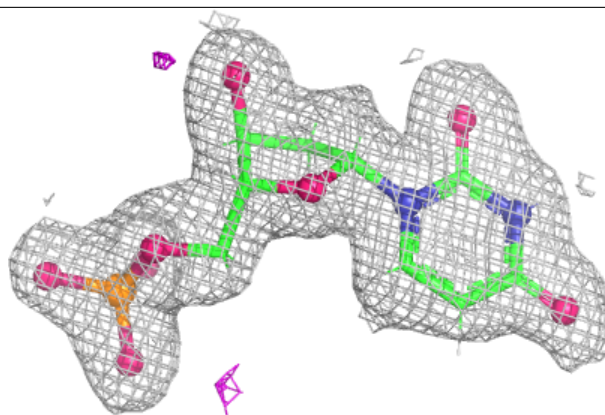
**Electron density around UMC F 301:**

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

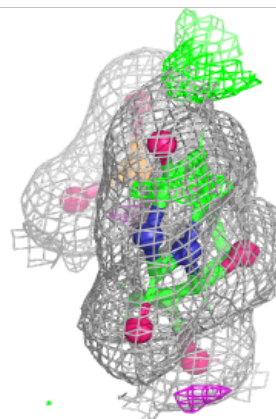
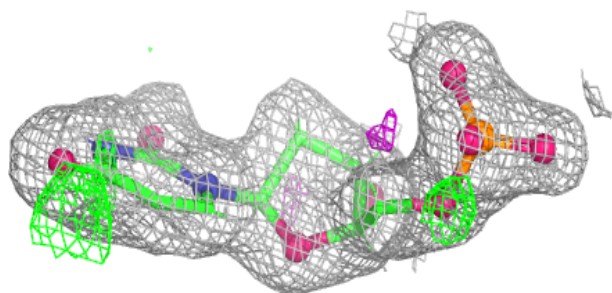
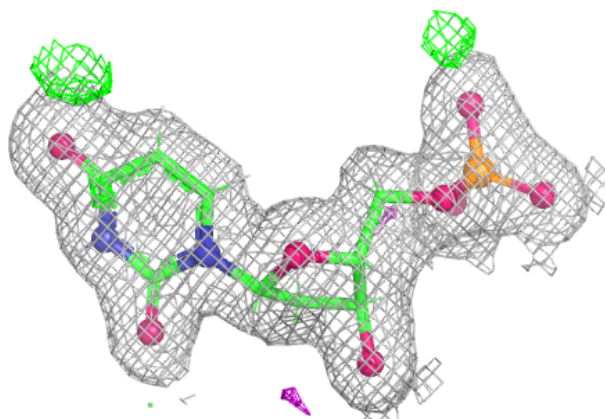


Electron density around UMP A 301:

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

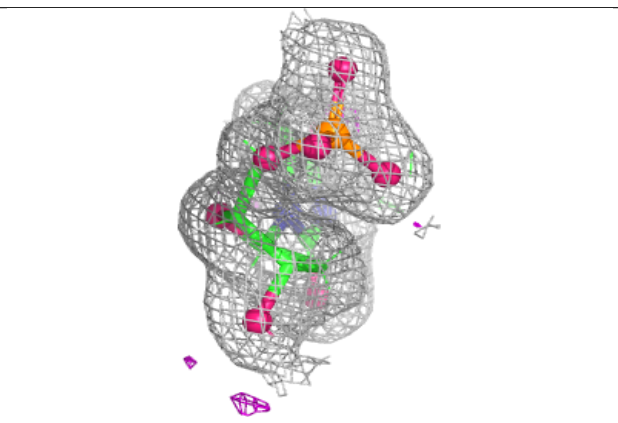
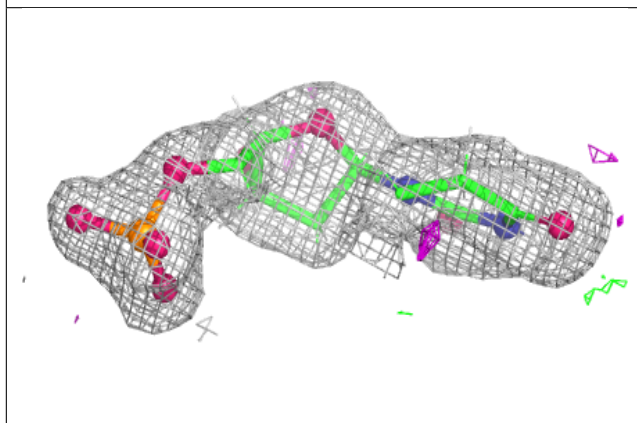
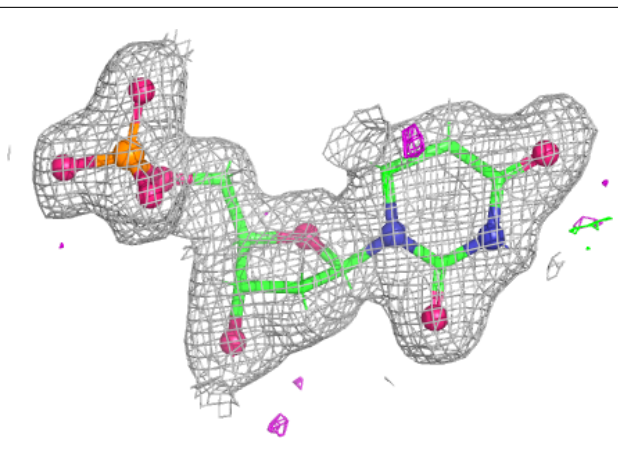
**Electron density around UMP C 301:**

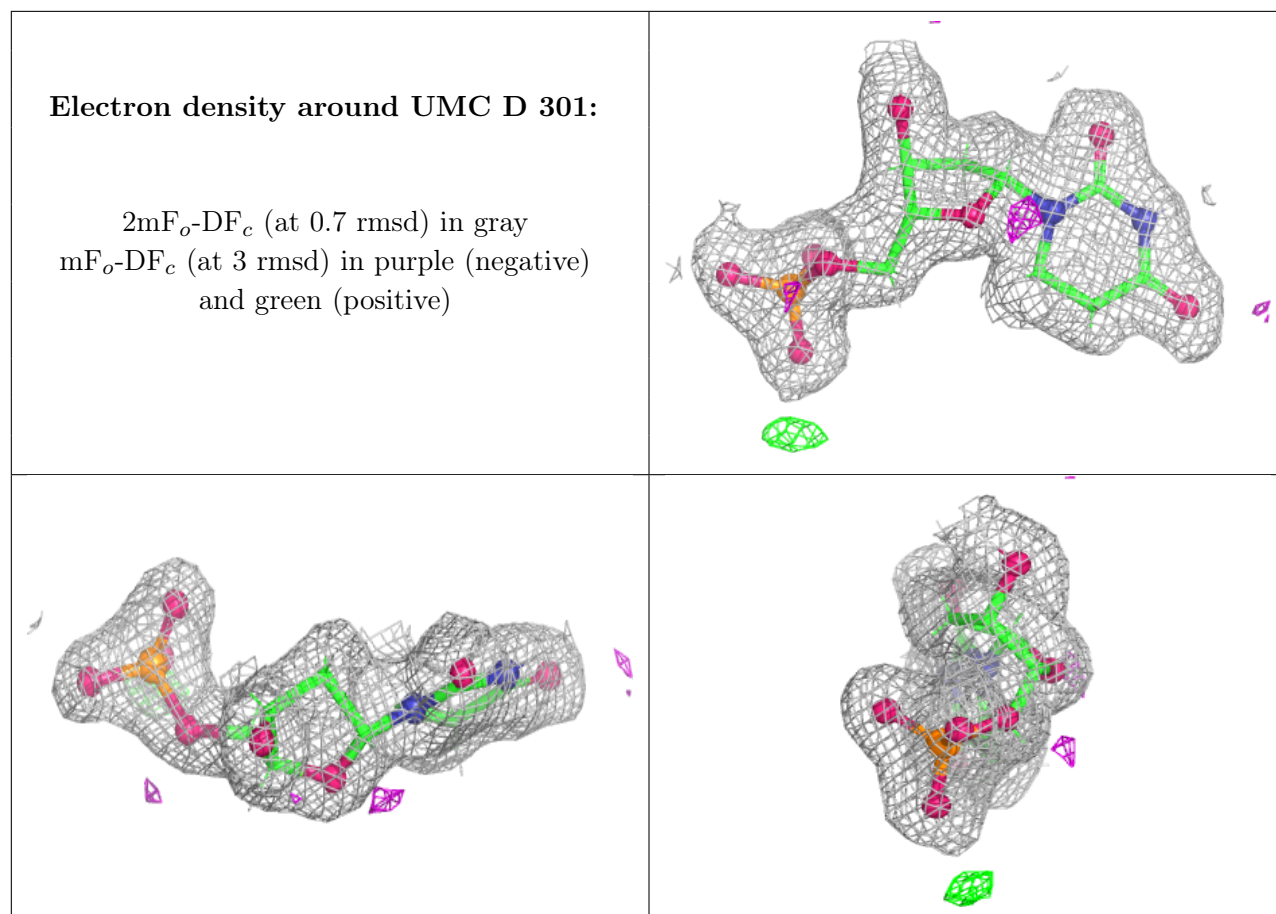
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around UMC B 301:

$2mF_o-DF_c$ (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.