



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2026 – 01:41 PM UTC

PDB ID : 5T7O / pdb_00005t7o
Title : Crystal structure of Trypanosoma cruzi Dihydrofolate Reductase-Thymidylate Synthase in complex with (6S)-5,6,7,8-TETRAHYDROFOLATE
Authors : Di Pisa, F.; Dello Iacono, L.; Bonucci, A.; Mangani, S.
Deposited on : 2016-09-05
Resolution : 1.80 Å(reported)

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

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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

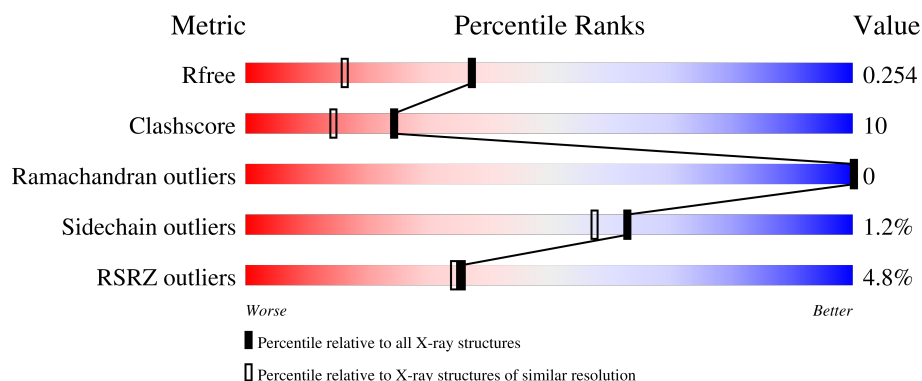
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 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	7662 (1.80-1.80)
Clashscore	190562	8479 (1.80-1.80)
Ramachandran outliers	187476	8391 (1.80-1.80)
Sidechain outliers	187428	8390 (1.80-1.80)
RSRZ outliers	180081	7663 (1.80-1.80)

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.

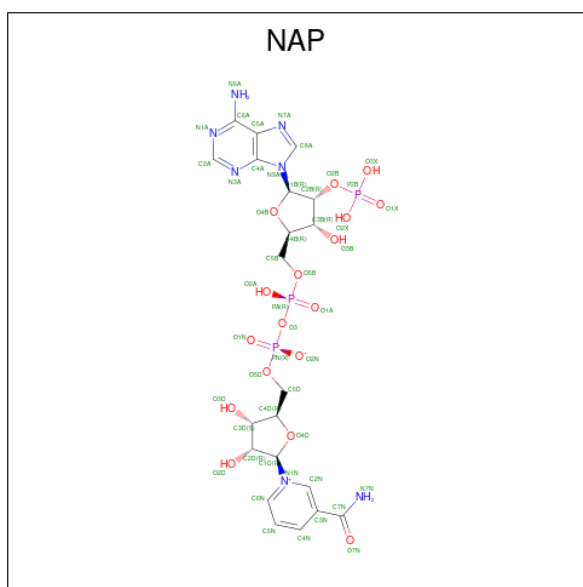
Mol	Chain	Length	Quality of chain
1	A	521	5% 78% 15% • 5%
1	B	521	5% 71% 22% • 5%
1	C	521	3% 77% 15% • 7%
1	D	521	5% 70% 22% • 6%

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 Bifunctional dihydrofolate reductase-thymidylate synthase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	494	Total 4003	C 2563	N 698	O 720	S 22	0	25	0
1	B	495	Total 4017	C 2572	N 701	O 722	S 22	0	21	0
1	C	487	Total 3947	C 2531	N 689	O 707	S 20	0	23	0
1	D	489	Total 3909	C 2501	N 684	O 707	S 17	0	13	0

- Molecule 2 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (CCD ID: NAP) (formula: $C_{21}H_{28}N_7O_{17}P_3$).



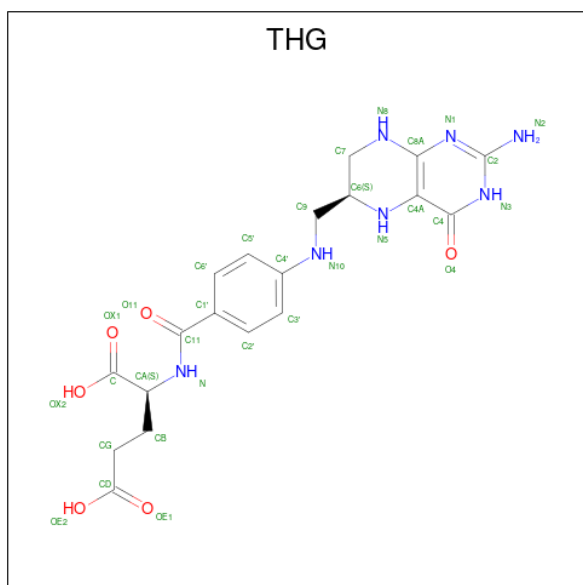
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total 48	C 21	N 7	O 17	P 3	0	0
2	B	1	Total 48	C 21	N 7	O 17	P 3	0	0

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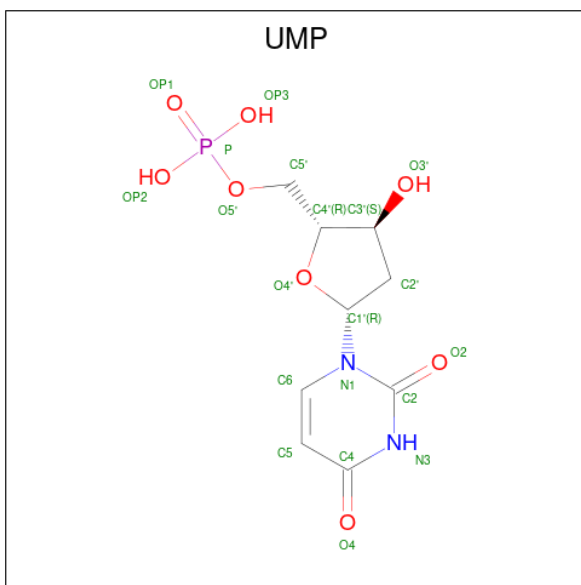
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	C	1	Total	C	N	O	0	0
			48	21	7	17		
2	D	1	Total	C	N	O	0	0
			48	21	7	17		

- Molecule 3 is (6S)-5,6,7,8-TETRAHYDROFOLATE (CCD ID: THG) (formula: C₁₉H₂₃N₇O₆).



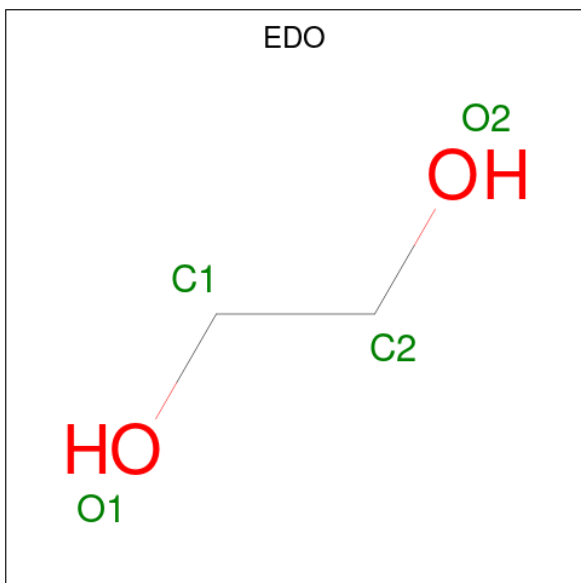
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			32	19	7	6		
3	B	1	Total	C	N	O	0	0
			32	19	7	6		
3	C	1	Total	C	N	O	0	0
			32	19	7	6		
3	D	1	Total	C	N	O	0	0
			32	19	7	6		

- Molecule 4 is 2'-DEOXYURIDINE 5'-MONOPHOSPHATE (CCD ID: UMP) (formula: C₉H₁₃N₂O₈P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			20	9	2	8	1		
4	B	1	Total	C	N	O	P	0	0
			20	9	2	8	1		
4	C	1	Total	C	N	O	P	0	0
			20	9	2	8	1		
4	D	1	Total	C	N	O	P	0	0
			20	9	2	8	1		

- Molecule 5 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C₂H₆O₂).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total C O 4 2 2	0	0
5	A	1	Total C O 4 2 2	0	0
5	A	1	Total C O 4 2 2	0	0
5	A	1	Total C O 4 2 2	0	0
5	A	1	Total C O 4 2 2	0	0
5	A	1	Total C O 4 2 2	0	0
5	A	1	Total C O 4 2 2	0	0
5	A	1	Total C O 4 2 2	0	0
5	A	1	Total C O 4 2 2	0	0
5	A	1	Total C O 4 2 2	0	0
5	A	1	Total C O 4 2 2	0	0
5	A	1	Total C O 4 2 2	0	0
5	A	1	Total C O 4 2 2	0	0
5	A	1	Total C O 4 2 2	0	0
5	B	1	Total C O 4 2 2	0	0
5	B	1	Total C O 4 2 2	0	0
5	B	1	Total C O 4 2 2	0	0
5	B	1	Total C O 4 2 2	0	0
5	B	1	Total C O 4 2 2	0	0
5	B	1	Total C O 4 2 2	0	0
5	B	1	Total C O 4 2 2	0	0
5	B	1	Total C O 4 2 2	0	0

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	B	1	Total	C	O	0	0
			4	2	2		
5	B	1	Total	C	O	0	0
			4	2	2		
5	B	1	Total	C	O	0	0
			4	2	2		
5	B	1	Total	C	O	0	0
			4	2	2		
5	C	1	Total	C	O	0	0
			4	2	2		
5	C	1	Total	C	O	0	0
			4	2	2		
5	C	1	Total	C	O	0	0
			4	2	2		
5	C	1	Total	C	O	0	0
			4	2	2		
5	C	1	Total	C	O	0	0
			4	2	2		
5	C	1	Total	C	O	0	0
			4	2	2		
5	C	1	Total	C	O	0	0
			4	2	2		
5	C	1	Total	C	O	0	0
			4	2	2		
5	C	1	Total	C	O	0	0
			4	2	2		
5	D	1	Total	C	O	0	0
			4	2	2		
5	D	1	Total	C	O	0	0
			4	2	2		
5	D	1	Total	C	O	0	0
			4	2	2		
5	D	1	Total	C	O	0	0
			4	2	2		
5	D	1	Total	C	O	0	0
			4	2	2		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	D	1	Total	C	O	0	0
			4	2	2		
5	D	1	Total	C	O	0	0
			4	2	2		
5	D	1	Total	C	O	0	0
			4	2	2		
5	D	1	Total	C	O	0	0
			4	2	2		

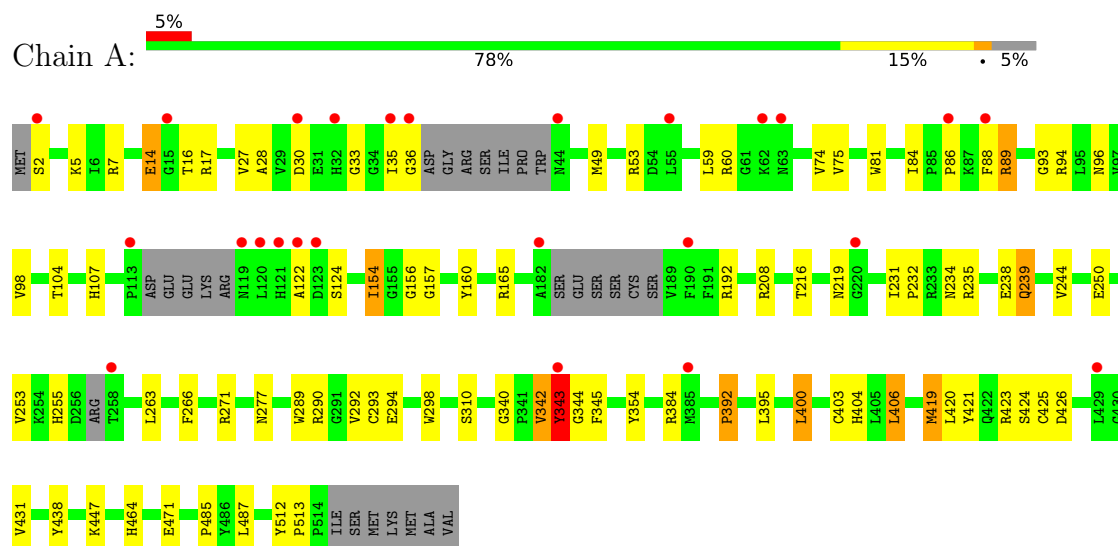
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	527	Total	O	0	0
			527	527		
6	B	514	Total	O	0	4
			514	514		
6	C	518	Total	O	0	1
			518	518		
6	D	465	Total	O	0	0
			465	465		

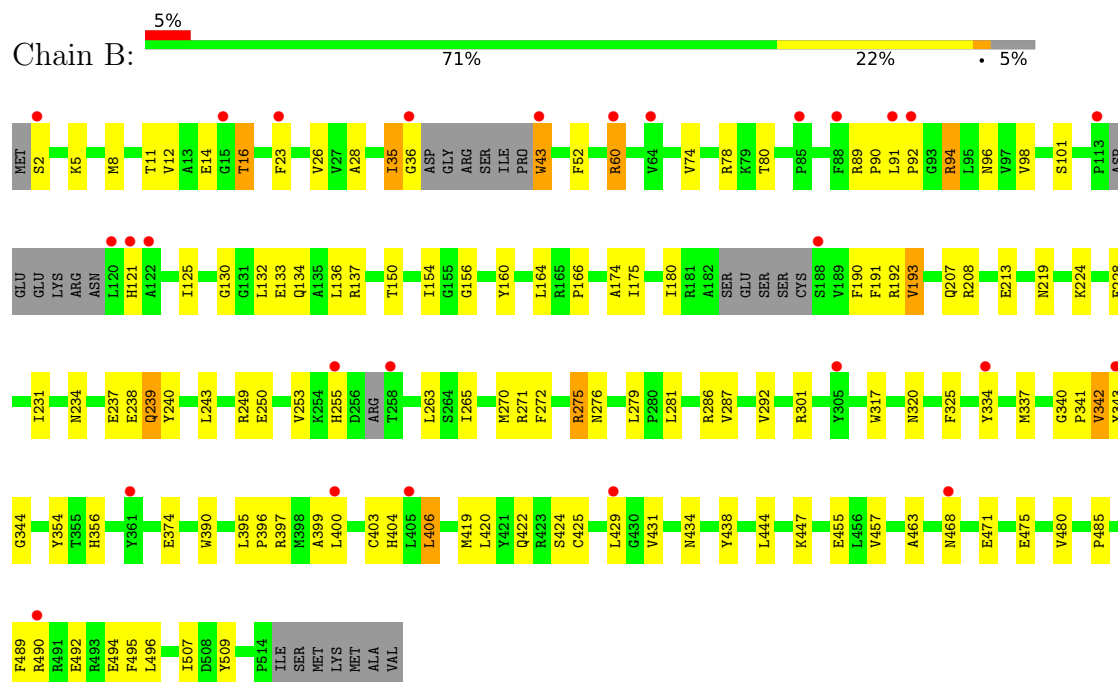
3 Residue-property plots [i](#)

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.

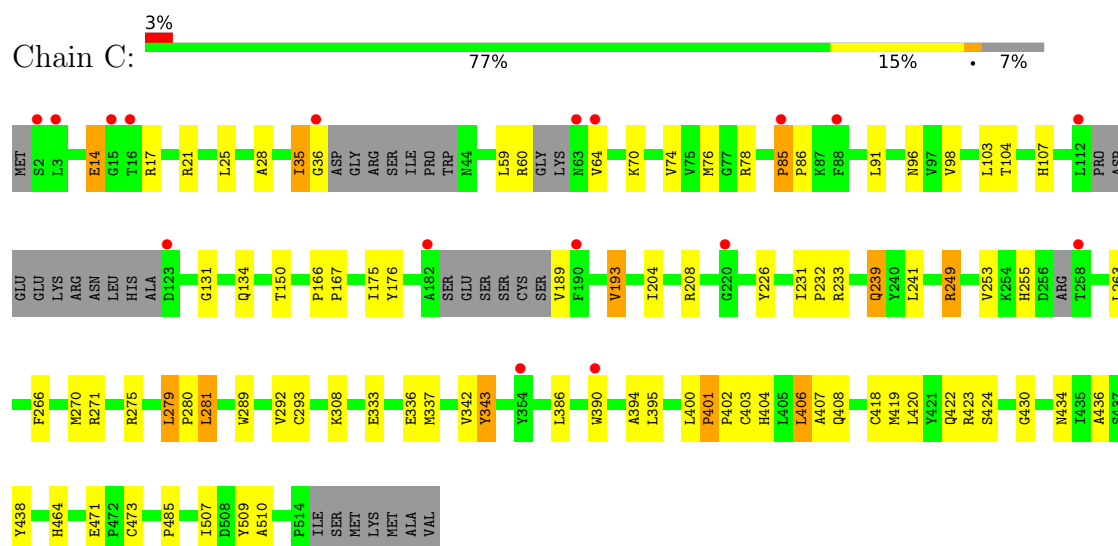
- Molecule 1: Bifunctional dihydrofolate reductase-thymidylate synthase



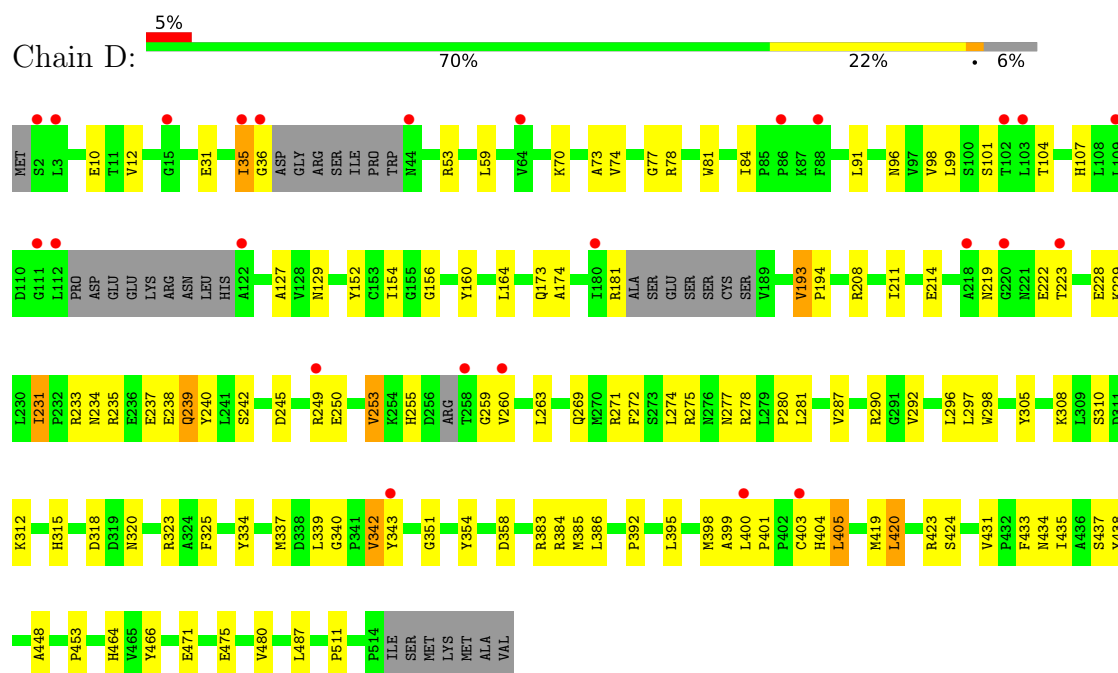
- Molecule 1: Bifunctional dihydrofolate reductase-thymidylate synthase



• Molecule 1: Bifunctional dihydrofolate reductase-thymidylate synthase



• Molecule 1: Bifunctional dihydrofolate reductase-thymidylate synthase



4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	154.55Å 173.54Å 174.16Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	86.77 – 1.80 86.77 – 1.80	Depositor EDS
% Data completeness (in resolution range)	99.2 (86.77-1.80) 99.2 (86.77-1.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.27 (at 1.80Å)	Xtriage
Refinement program	REFMAC 5.8.0135	Depositor
R, R_{free}	0.177 , 0.220 (Not available) , 0.254	Depositor DCC
R_{free} test set	10547 reflections (4.91%)	wwPDB-VP
Wilson B-factor (Å ²)	21.4	Xtriage
Anisotropy	0.065	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 43.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	0.013 for -h,-l,-k	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	18488	wwPDB-VP
Average B, all atoms (Å ²)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 48.86 % 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 8.0996e-05. 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: THG, NAP, EDO, 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	1.58	35/4161 (0.8%)	1.30	21/5648 (0.4%)
1	B	1.57	35/4169 (0.8%)	1.30	21/5659 (0.4%)
1	C	1.56	29/4092 (0.7%)	1.32	13/5550 (0.2%)
1	D	1.57	43/4027 (1.1%)	1.29	18/5467 (0.3%)
All	All	1.57	142/16449 (0.9%)	1.30	73/22324 (0.3%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

The worst 5 of 142 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	385	MET	C-N	-14.35	1.15	1.33
1	C	343	TYR	CB-CG	12.97	1.80	1.51
1	A	487	LEU	N-CA	8.32	1.56	1.46
1	D	419	MET	SD-CE	-8.14	1.59	1.79
1	B	166	PRO	CA-C	8.05	1.57	1.52

The worst 5 of 73 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	471	GLU	CA-C-N	-9.21	110.26	119.56
1	B	471	GLU	C-N-CA	-9.21	110.26	119.56
1	D	342	VAL	N-CA-C	8.85	119.69	110.05
1	C	343	TYR	CA-CB-CG	-7.30	100.75	113.90

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	14	GLU	N-CA-C	7.28	118.86	111.07

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	343	TYR	Mainchain

5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4003	0	3985	66	0
1	B	4017	0	3996	104	0
1	C	3947	0	3957	73	0
1	D	3909	0	3857	83	0
2	A	48	0	25	5	0
2	B	48	0	25	11	0
2	C	48	0	25	3	0
2	D	48	0	25	8	0
3	A	32	0	21	3	0
3	B	32	0	21	2	0
3	C	32	0	21	1	0
3	D	32	0	21	3	0
4	A	20	0	11	5	0
4	B	20	0	11	3	0
4	C	20	0	11	4	0
4	D	20	0	11	2	0
5	A	56	0	84	5	0
5	B	48	0	72	8	0
5	C	44	0	66	9	0
5	D	40	0	60	3	0
6	A	527	0	0	13	0
6	B	514	0	0	20	0
6	C	518	0	0	9	0
6	D	465	0	0	15	0
All	All	18488	0	16305	326	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 10.

The worst 5 of 326 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:343:TYR:CG	1:C:343:TYR:CB	1.80	1.64
1:B:8[B]:MET:HE1	1:B:496:LEU:N	1.42	1.34
1:B:337:MET:HG3	6:B:1142:HOH:O	1.42	1.19
1:B:8[B]:MET:CE	1:B:496:LEU:N	2.07	1.15
1:D:337:MET:HG3	6:D:1228:HOH:O	1.47	1.15

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	508/521 (98%)	494 (97%)	14 (3%)	0	100	100
1	B	506/521 (97%)	495 (98%)	11 (2%)	0	100	100
1	C	497/521 (95%)	485 (98%)	12 (2%)	0	100	100
1	D	491/521 (94%)	474 (96%)	17 (4%)	0	100	100
All	All	2002/2084 (96%)	1948 (97%)	54 (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	429/446 (96%)	423 (99%)	6 (1%)	59	52
1	B	431/446 (97%)	423 (98%)	8 (2%)	50	41
1	C	424/446 (95%)	415 (98%)	9 (2%)	47	36
1	D	413/446 (93%)	408 (99%)	5 (1%)	63	57
All	All	1697/1784 (95%)	1669 (98%)	28 (2%)	63	47

5 of 28 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	35[A]	ILE
1	D	420	LEU
1	C	193[A]	VAL
1	D	35[B]	ILE
1	C	189	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 29 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	134	GLN
1	D	315	HIS
1	C	255	HIS
1	D	173	GLN
1	C	239	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry

59 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z > 2$	Counts	RMSZ	# $ Z > 2$
5	EDO	A	711	-	3,3,3	0.42	0	2,2,2	0.38	0
5	EDO	D	706	-	3,3,3	0.43	0	2,2,2	0.38	0
5	EDO	A	716	-	3,3,3	0.45	0	2,2,2	1.18	0
5	EDO	A	704	-	3,3,3	0.42	0	2,2,2	0.38	0
5	EDO	D	707	-	3,3,3	0.40	0	2,2,2	0.64	0
5	EDO	D	708	-	3,3,3	0.43	0	2,2,2	0.38	0
5	EDO	D	712	-	3,3,3	0.38	0	2,2,2	0.22	0
5	EDO	C	612	-	3,3,3	0.83	0	2,2,2	0.71	0
5	EDO	A	708	-	3,3,3	0.38	0	2,2,2	0.41	0
5	EDO	C	606	-	3,3,3	0.42	0	2,2,2	0.38	0
5	EDO	D	709	-	3,3,3	0.89	0	2,2,2	0.75	0
5	EDO	D	713	-	3,3,3	0.42	0	2,2,2	0.38	0
5	EDO	A	706	-	3,3,3	0.61	0	2,2,2	0.80	0
5	EDO	D	704	-	3,3,3	0.43	0	2,2,2	0.88	0
5	EDO	B	604	-	3,3,3	0.42	0	2,2,2	0.38	0
5	EDO	B	612	-	3,3,3	0.43	0	2,2,2	0.38	0
5	EDO	C	605	-	3,3,3	0.33	0	2,2,2	0.82	0
5	EDO	C	607	-	3,3,3	0.43	0	2,2,2	0.38	0
5	EDO	C	610	-	3,3,3	0.42	0	2,2,2	0.38	0
2	NAP	C	602	-	50,52,52	1.80	9 (18%)	71,80,80	2.25	29 (40%)
5	EDO	A	713	-	3,3,3	0.96	0	2,2,2	0.46	0
3	THG	A	702	-	32,34,34	1.80	7 (21%)	39,47,47	1.74	8 (20%)
2	NAP	B	603	-	50,52,52	1.84	11 (22%)	71,80,80	1.86	20 (28%)
5	EDO	C	613	-	3,3,3	0.43	0	2,2,2	0.38	0
4	UMP	D	702	-	21,21,21	0.53	0	30,31,31	0.53	1 (3%)
5	EDO	A	715	-	3,3,3	0.47	0	2,2,2	0.73	0
5	EDO	B	606	-	3,3,3	0.42	0	2,2,2	0.38	0
3	THG	B	601	-	32,34,34	2.06	7 (21%)	39,47,47	1.54	6 (15%)
5	EDO	A	717	-	3,3,3	0.45	0	2,2,2	0.80	0
5	EDO	B	607	-	3,3,3	0.43	0	2,2,2	0.38	0
5	EDO	A	709	-	3,3,3	0.42	0	2,2,2	0.38	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	EDO	C	608	-	3,3,3	0.43	0	2,2,2	0.38	0
5	EDO	B	614	-	3,3,3	0.31	0	2,2,2	0.99	0
5	EDO	A	710	-	3,3,3	0.53	0	2,2,2	0.75	0
5	EDO	C	604	-	3,3,3	0.63	0	2,2,2	0.40	0
5	EDO	B	613	-	3,3,3	0.43	0	2,2,2	0.38	0
3	THG	D	703	-	32,34,34	1.36	3 (9%)	39,47,47	1.27	4 (10%)
5	EDO	A	707	-	3,3,3	0.47	0	2,2,2	0.78	0
2	NAP	A	701	-	50,52,52	1.73	9 (18%)	71,80,80	1.99	18 (25%)
2	NAP	D	701	-	50,52,52	1.46	8 (16%)	71,80,80	1.74	17 (23%)
5	EDO	C	609	-	3,3,3	0.43	0	2,2,2	0.38	0
5	EDO	B	608	-	3,3,3	0.42	0	2,2,2	0.38	0
5	EDO	D	710	-	3,3,3	0.43	0	2,2,2	0.38	0
5	EDO	D	711	-	3,3,3	0.41	0	2,2,2	0.75	0
5	EDO	A	714	-	3,3,3	0.43	0	2,2,2	0.38	0
5	EDO	A	705	-	3,3,3	0.56	0	2,2,2	0.79	0
4	UMP	B	602	-	21,21,21	0.85	2 (9%)	30,31,31	0.82	2 (6%)
5	EDO	C	614	-	3,3,3	0.43	0	2,2,2	0.38	0
5	EDO	A	712	-	3,3,3	0.41	0	2,2,2	0.42	0
5	EDO	B	609	-	3,3,3	0.43	0	2,2,2	0.38	0
4	UMP	A	703	-	21,21,21	0.54	0	30,31,31	0.55	1 (3%)
5	EDO	B	615	-	3,3,3	0.75	0	2,2,2	0.43	0
5	EDO	C	611	-	3,3,3	0.43	0	2,2,2	0.38	0
5	EDO	D	705	-	3,3,3	0.43	0	2,2,2	0.38	0
3	THG	C	601	-	32,34,34	1.67	6 (18%)	39,47,47	2.04	12 (30%)
4	UMP	C	603	-	21,21,21	0.54	0	30,31,31	0.54	1 (3%)
5	EDO	B	605	-	3,3,3	0.67	0	2,2,2	0.74	0
5	EDO	B	610	-	3,3,3	0.49	0	2,2,2	0.63	0
5	EDO	B	611	-	3,3,3	0.43	0	2,2,2	0.38	0

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
5	EDO	A	711	-	-	1/1/1/1	-
5	EDO	D	706	-	-	1/1/1/1	-
5	EDO	A	716	-	-	0/1/1/1	-
5	EDO	A	704	-	-	1/1/1/1	-
5	EDO	D	707	-	-	1/1/1/1	-
5	EDO	D	708	-	-	1/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	EDO	D	712	-	-	1/1/1/1	-
5	EDO	C	612	-	-	0/1/1/1	-
5	EDO	A	708	-	-	1/1/1/1	-
5	EDO	C	606	-	-	1/1/1/1	-
5	EDO	D	709	-	-	0/1/1/1	-
5	EDO	D	713	-	-	0/1/1/1	-
5	EDO	A	706	-	-	0/1/1/1	-
5	EDO	D	704	-	-	0/1/1/1	-
5	EDO	B	604	-	-	1/1/1/1	-
5	EDO	B	612	-	-	0/1/1/1	-
5	EDO	C	605	-	-	1/1/1/1	-
5	EDO	C	607	-	-	1/1/1/1	-
5	EDO	C	610	-	-	1/1/1/1	-
2	NAP	C	602	-	-	4/35/67/67	0/5/5/5
5	EDO	A	713	-	-	1/1/1/1	-
3	THG	A	702	-	-	2/22/31/31	0/3/3/3
2	NAP	B	603	-	-	3/35/67/67	0/5/5/5
5	EDO	C	613	-	-	1/1/1/1	-
4	UMP	D	702	-	-	1/10/22/22	0/2/2/2
5	EDO	A	715	-	-	1/1/1/1	-
5	EDO	B	606	-	-	0/1/1/1	-
3	THG	B	601	-	-	1/22/31/31	0/3/3/3
5	EDO	A	717	-	-	0/1/1/1	-
5	EDO	B	607	-	-	1/1/1/1	-
5	EDO	A	709	-	-	0/1/1/1	-
5	EDO	C	608	-	-	1/1/1/1	-
5	EDO	B	614	-	-	1/1/1/1	-
5	EDO	A	710	-	-	0/1/1/1	-
5	EDO	C	604	-	-	0/1/1/1	-
5	EDO	B	613	-	-	1/1/1/1	-
3	THG	D	703	-	-	5/22/31/31	0/3/3/3
5	EDO	A	707	-	-	1/1/1/1	-
2	NAP	A	701	-	-	5/35/67/67	0/5/5/5
2	NAP	D	701	-	-	2/35/67/67	0/5/5/5
5	EDO	C	609	-	-	1/1/1/1	-
5	EDO	B	608	-	-	1/1/1/1	-
5	EDO	D	710	-	-	1/1/1/1	-
5	EDO	D	711	-	-	0/1/1/1	-
5	EDO	A	714	-	-	0/1/1/1	-
5	EDO	A	705	-	-	0/1/1/1	-
4	UMP	B	602	-	-	1/10/22/22	0/2/2/2

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	EDO	C	614	-	-	0/1/1/1	-
5	EDO	A	712	-	-	0/1/1/1	-
5	EDO	B	609	-	-	1/1/1/1	-
4	UMP	A	703	-	-	1/10/22/22	0/2/2/2
5	EDO	B	615	-	-	0/1/1/1	-
5	EDO	C	611	-	-	1/1/1/1	-
5	EDO	D	705	-	-	0/1/1/1	-
3	THG	C	601	-	-	5/22/31/31	0/3/3/3
4	UMP	C	603	-	-	1/10/22/22	0/2/2/2
5	EDO	B	605	-	-	0/1/1/1	-
5	EDO	B	610	-	-	0/1/1/1	-
5	EDO	B	611	-	-	1/1/1/1	-

The worst 5 of 62 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	601	THG	C4A-C8A	8.01	1.52	1.38
3	A	702	THG	C4A-C8A	7.07	1.50	1.38
2	A	701	NAP	PA-O3	6.44	1.66	1.59
2	C	602	NAP	PA-O3	6.31	1.66	1.59
2	B	603	NAP	PN-O3	5.87	1.65	1.59

The worst 5 of 119 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	601	THG	C2-N1-C8A	5.91	123.80	113.36
3	A	702	THG	C2-N1-C8A	5.75	123.51	113.36
2	C	602	NAP	N9A-C8A-N7A	-5.34	106.36	113.94
2	A	701	NAP	N3A-C2A-N1A	-5.25	120.63	128.58
2	A	701	NAP	C4A-N9A-C8A	5.19	111.19	105.74

There are no chirality outliers.

5 of 57 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	602	NAP	C2N-C3N-C7N-O7N
2	C	602	NAP	C2N-C3N-C7N-N7N
2	C	602	NAP	C4N-C3N-C7N-N7N
3	C	601	THG	C7-C6-C9-N10
3	C	601	THG	N5-C6-C9-N10

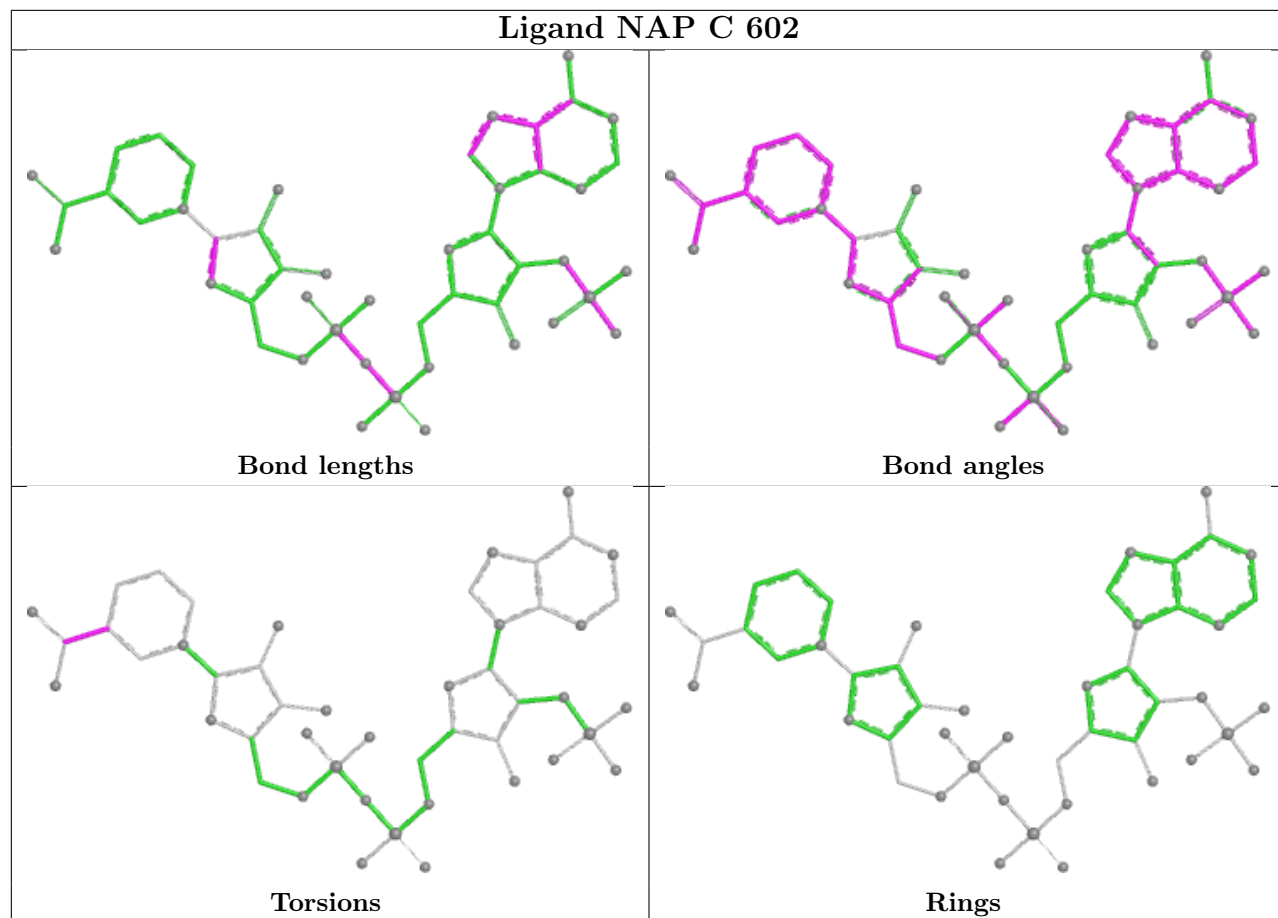
There are no ring outliers.

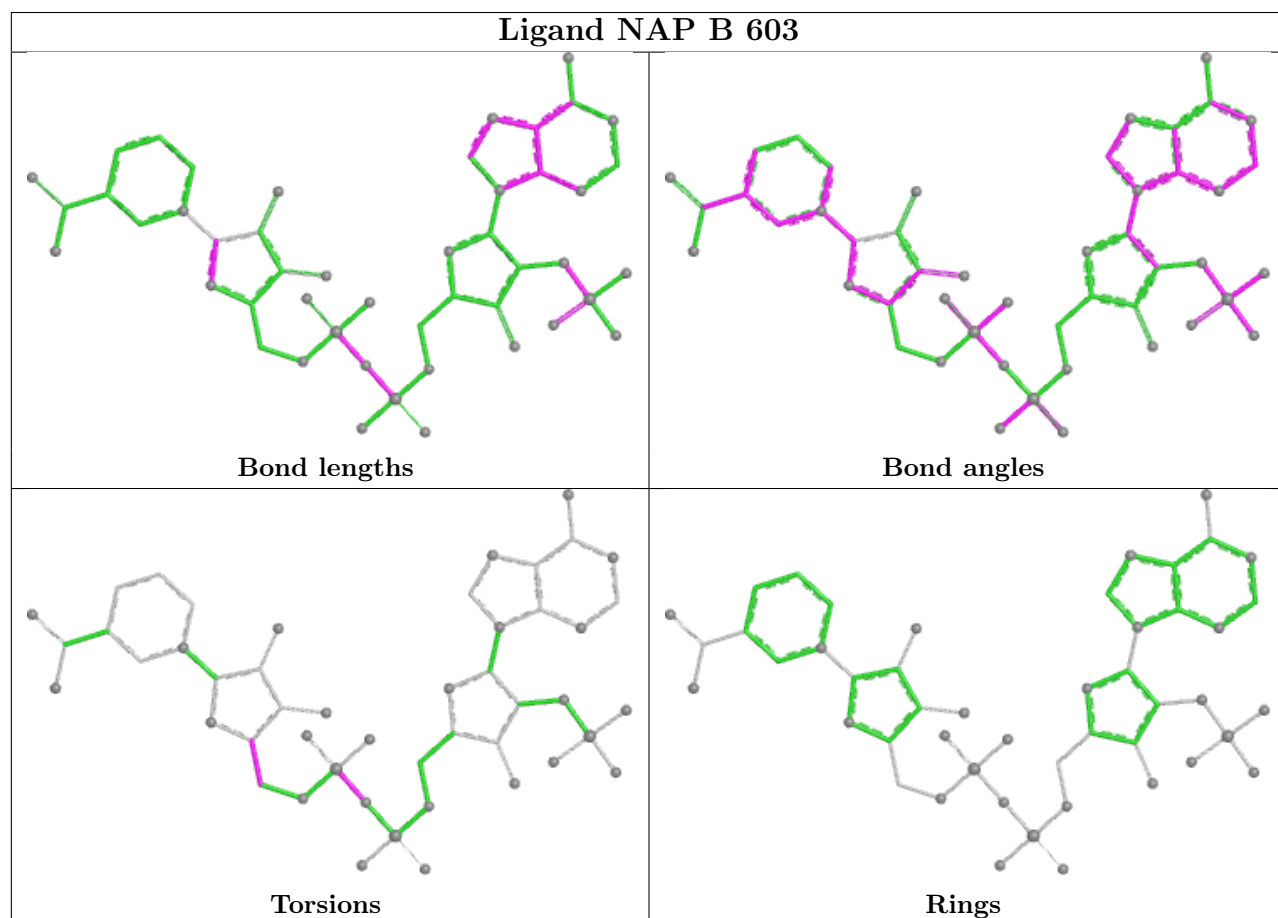
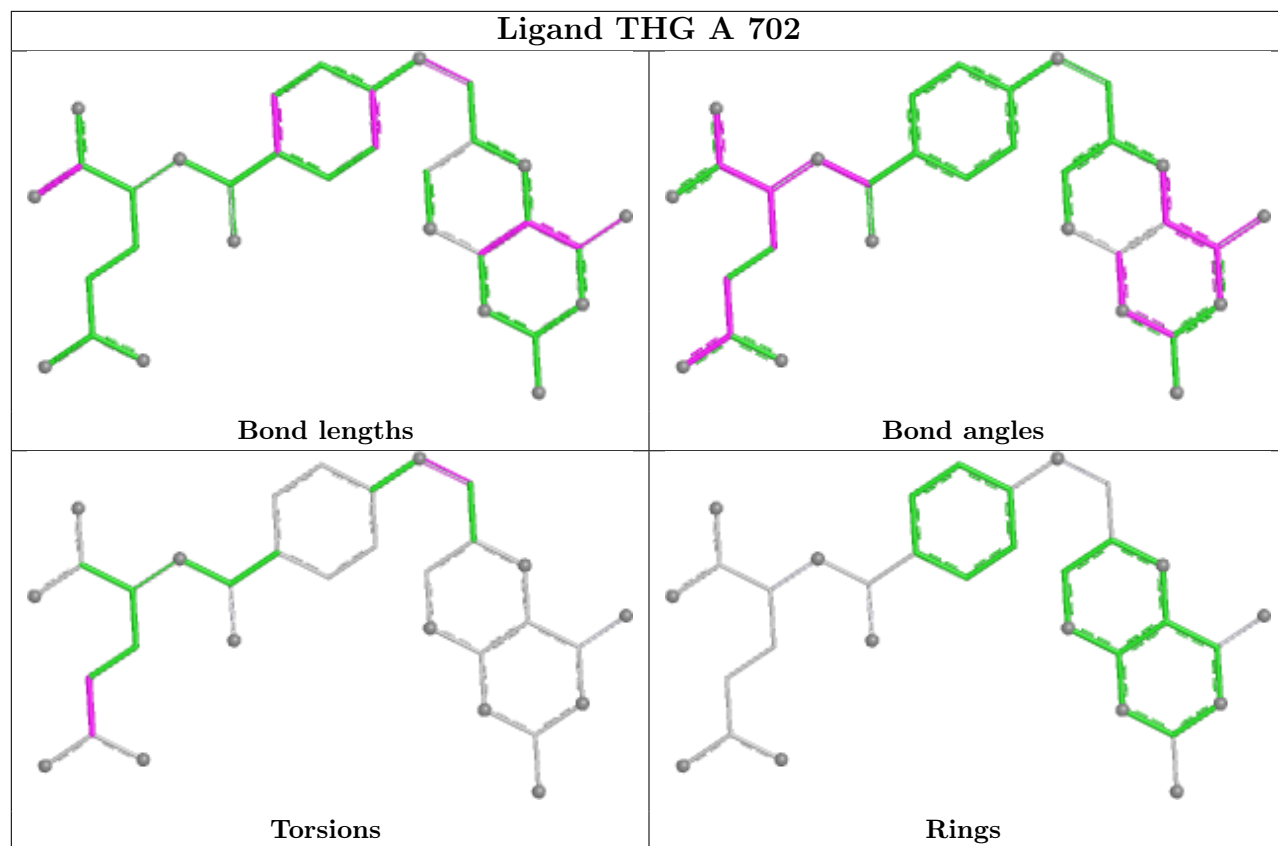
29 monomers are involved in 73 short contacts:

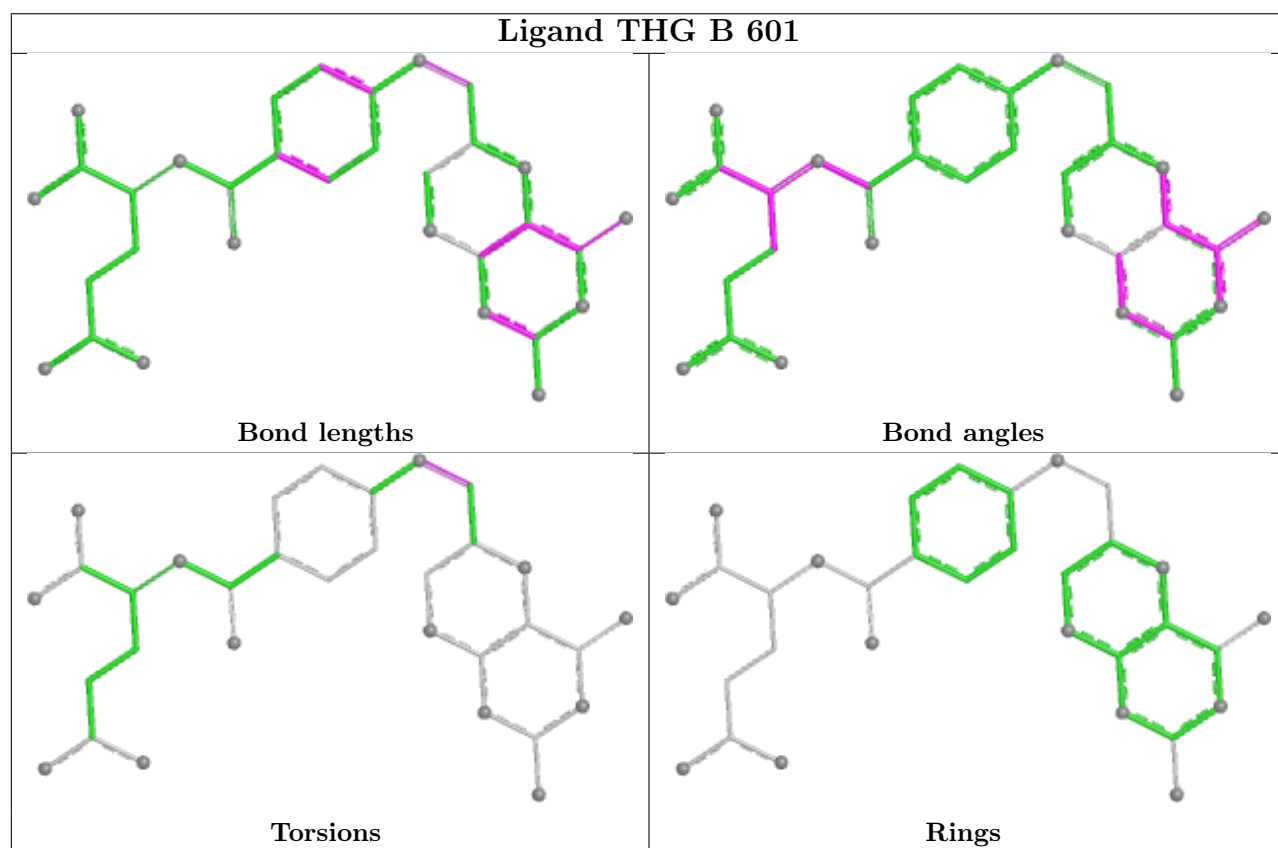
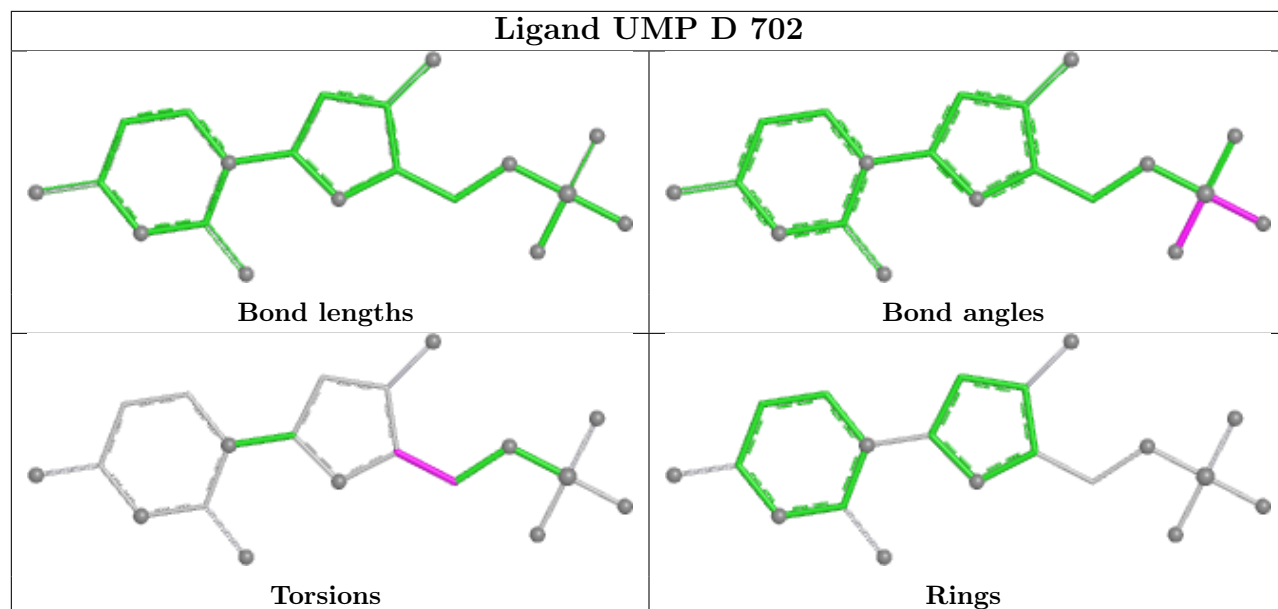
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	D	708	EDO	2	0
5	A	708	EDO	1	0
5	B	612	EDO	1	0
5	C	607	EDO	1	0
5	C	610	EDO	3	0
2	C	602	NAP	3	0
5	A	713	EDO	1	0
3	A	702	THG	3	0
2	B	603	NAP	11	0
4	D	702	UMP	2	0
5	B	606	EDO	2	0
3	B	601	THG	2	0
5	A	717	EDO	1	0
5	B	614	EDO	1	0
5	C	604	EDO	1	0
5	B	613	EDO	2	0
3	D	703	THG	3	0
2	A	701	NAP	5	0
2	D	701	NAP	8	0
5	D	710	EDO	1	0
5	A	714	EDO	2	0
4	B	602	UMP	3	0
5	C	614	EDO	2	0
5	B	609	EDO	1	0
4	A	703	UMP	5	0
5	C	611	EDO	3	0
3	C	601	THG	1	0
4	C	603	UMP	4	0
5	B	611	EDO	1	0

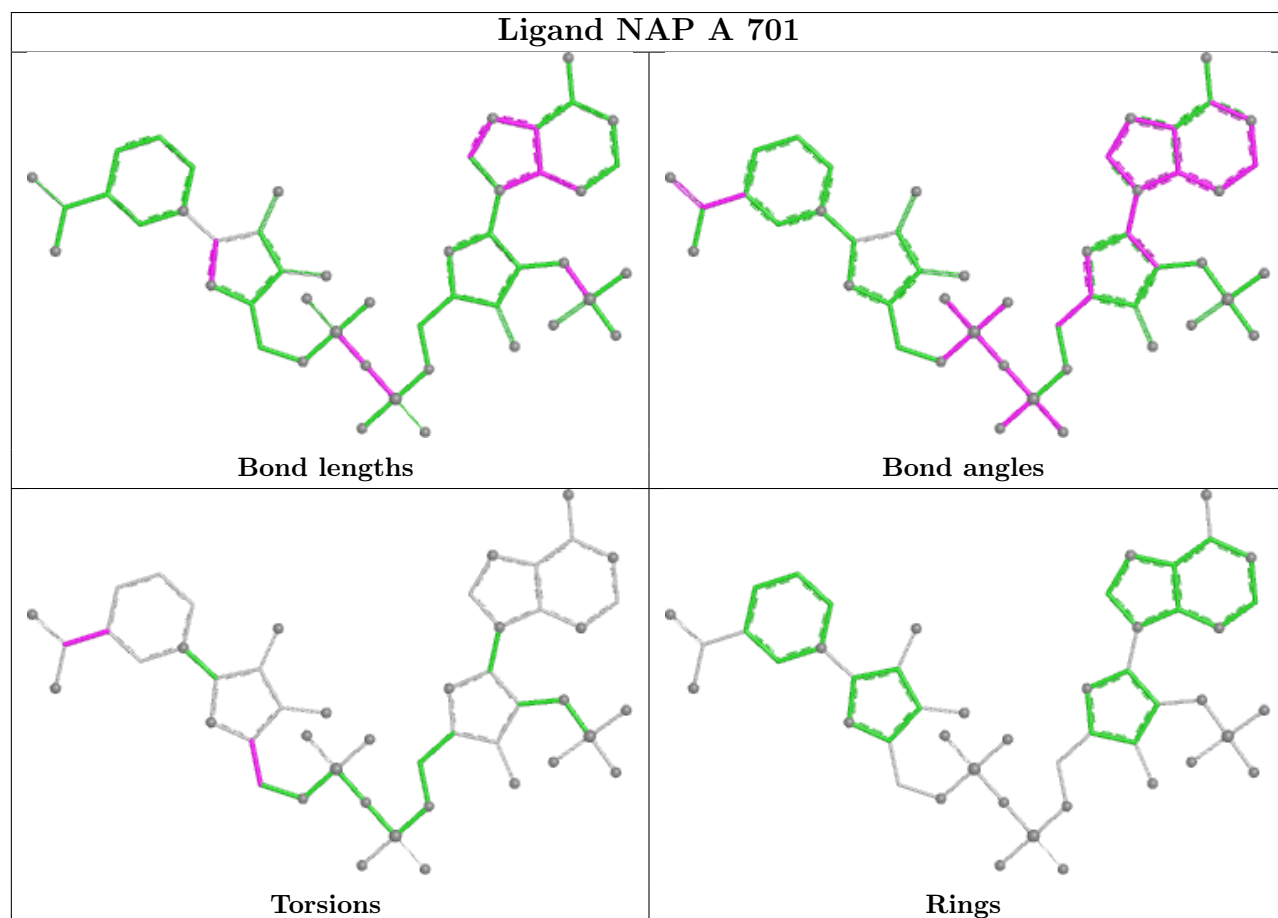
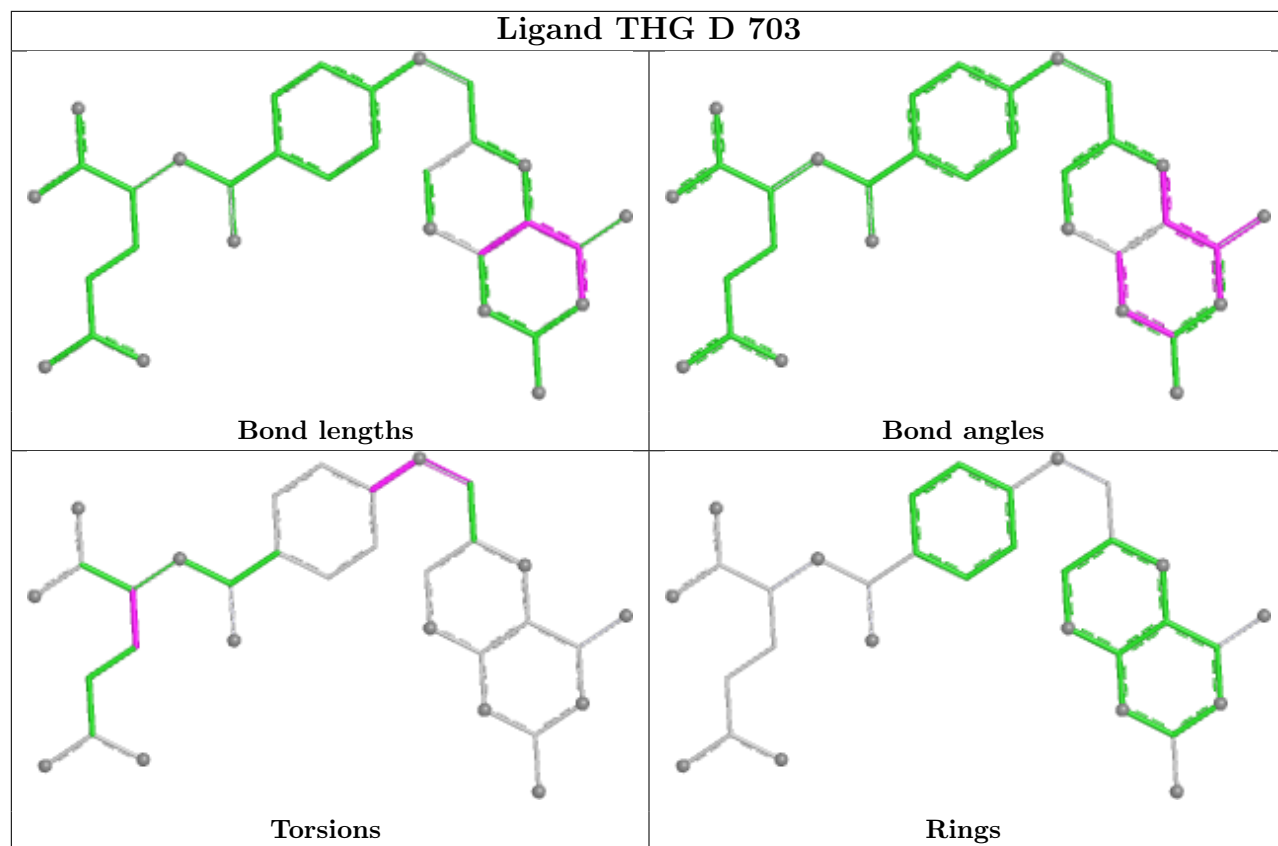
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

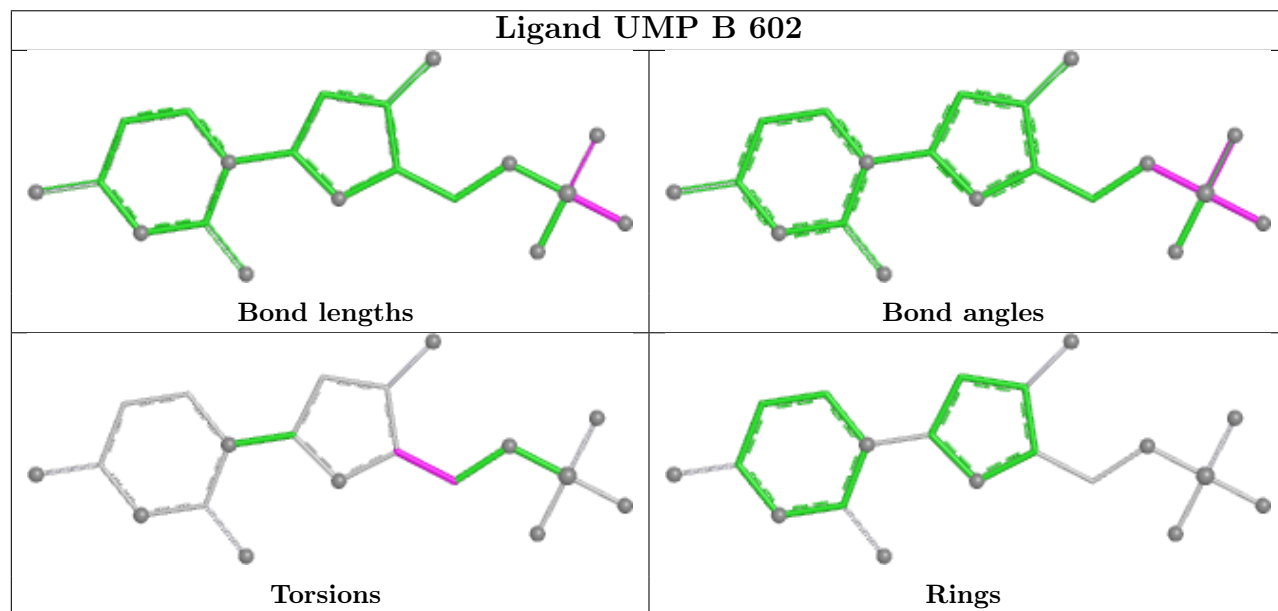
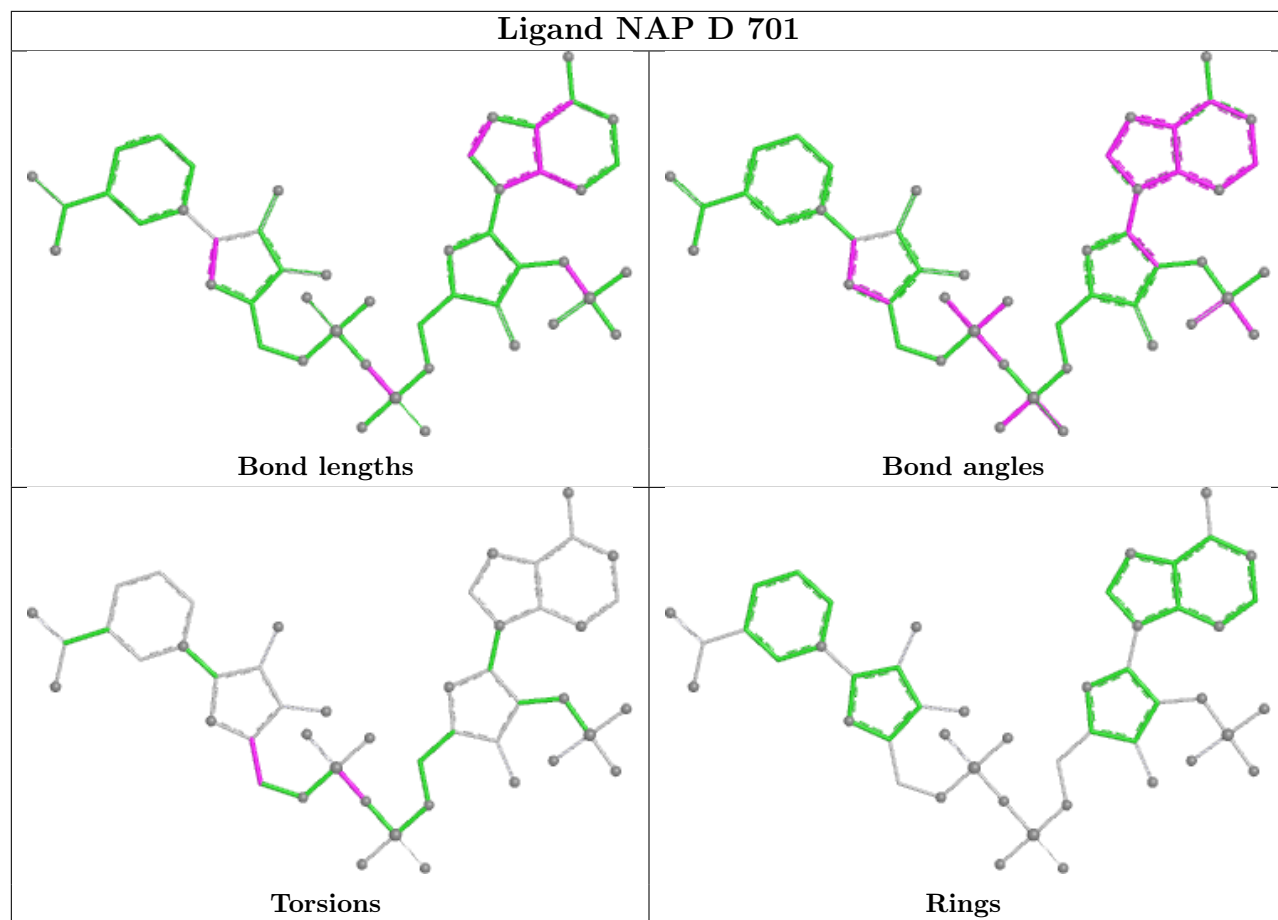
equivalents in the CSD to analyse the geometry.

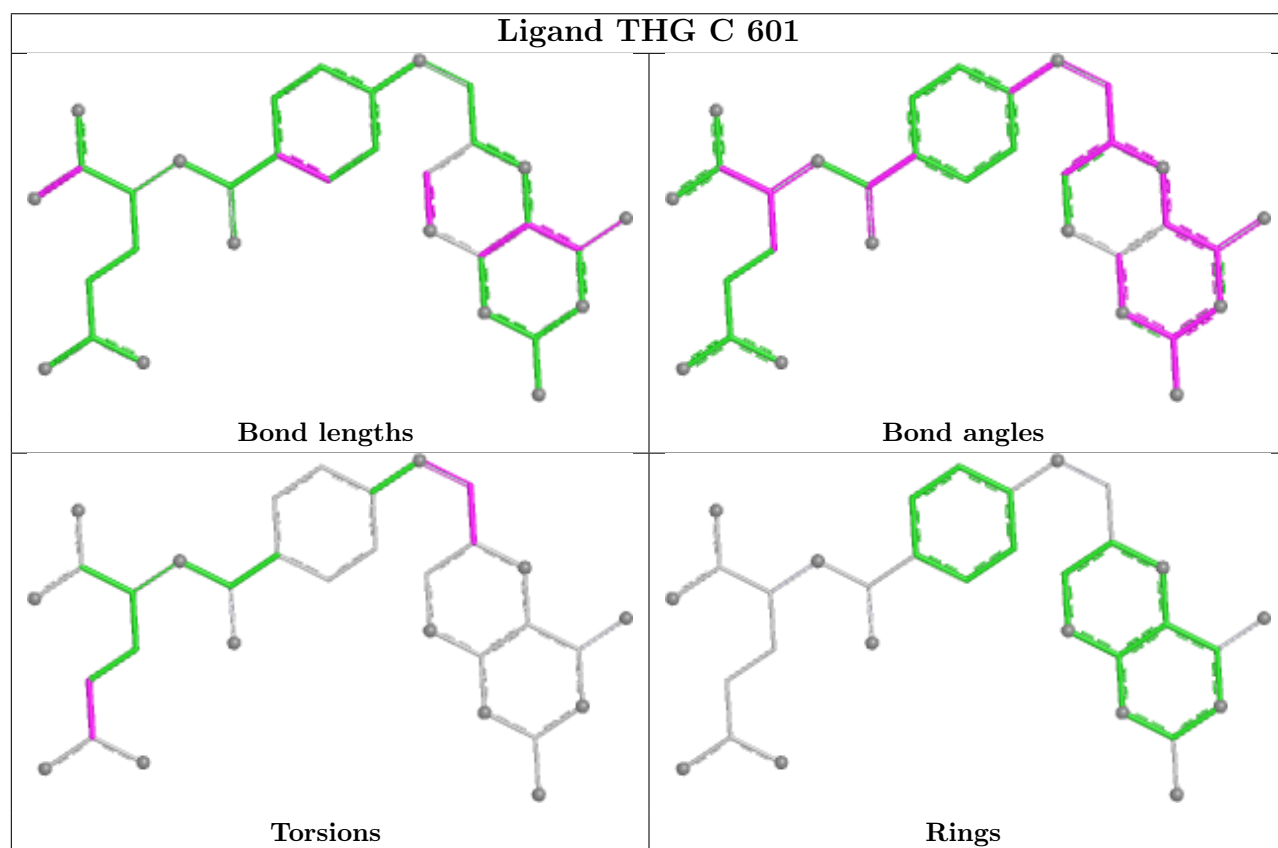
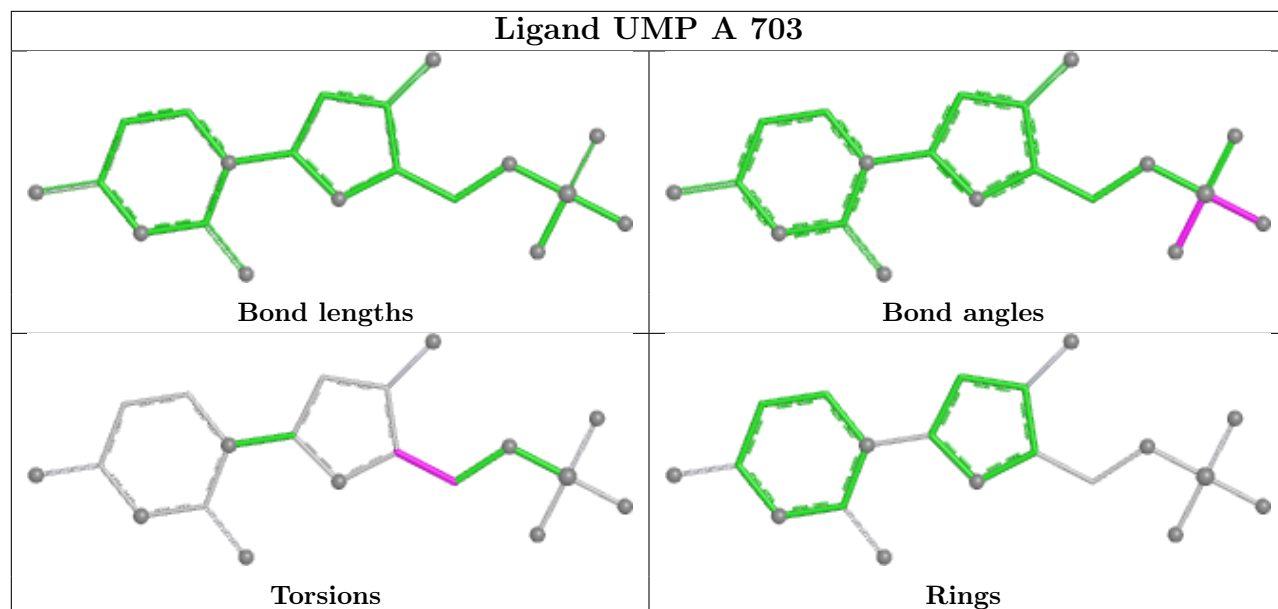


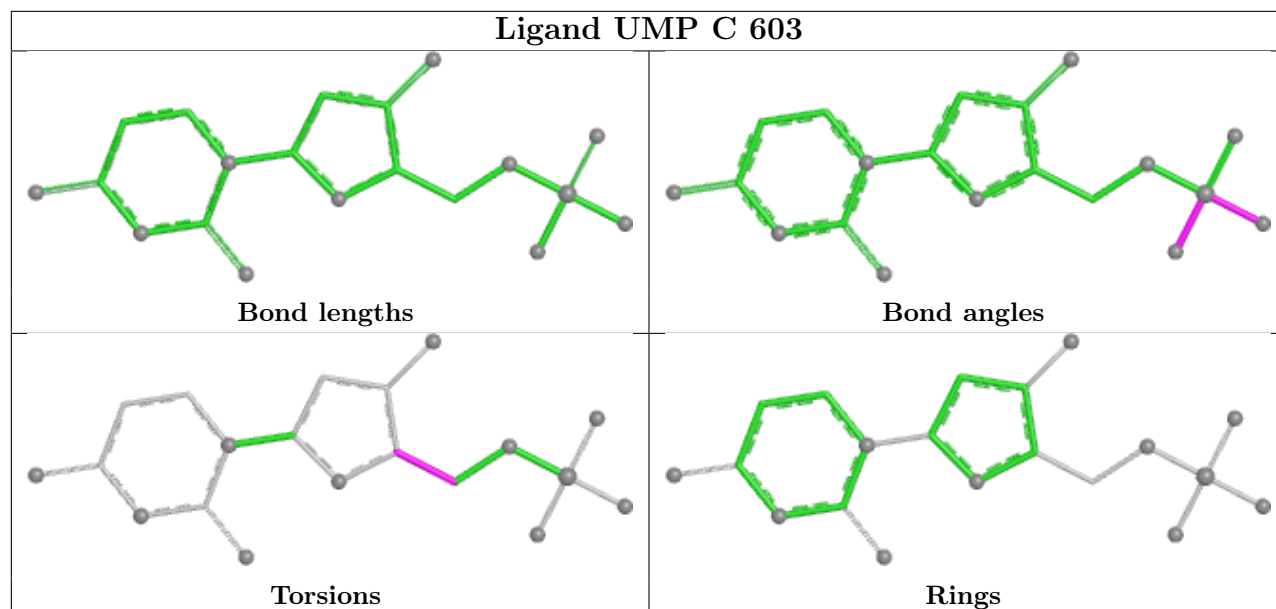












5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	D	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	D	385:MET	C	386:LEU	N	1.14

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	494/521 (94%)	-0.05	25 (5%) 33 32	8, 21, 45, 66	24 (4%)
1	B	495/521 (95%)	-0.04	27 (5%) 30 29	9, 21, 44, 69	22 (4%)
1	C	487/521 (93%)	-0.08	17 (3%) 47 47	8, 21, 42, 65	23 (4%)
1	D	489/521 (93%)	0.07	25 (5%) 33 32	7, 23, 48, 69	13 (2%)
All	All	1965/2084 (94%)	-0.02	94 (4%) 35 34	7, 22, 45, 69	82 (4%)

The worst 5 of 94 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	36[A]	GLY	6.4
1	B	343	TYR	5.9
1	A	258	THR	5.8
1	B	400	LEU	5.8
1	D	400	LEU	5.5

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
5	EDO	A	714	4/4	0.75	0.20	38,39,49,51	0
3	THG	D	703	32/32	0.76	0.15	30,46,64,65	0
4	UMP	D	702	20/20	0.77	0.16	32,48,62,62	0
4	UMP	C	603	20/20	0.77	0.15	27,46,54,54	0
5	EDO	A	715	4/4	0.78	0.15	52,55,57,58	0
5	EDO	C	608	4/4	0.78	0.22	35,47,49,71	0
5	EDO	D	710	4/4	0.78	0.19	40,41,45,47	0
4	UMP	A	703	20/20	0.79	0.16	25,39,48,50	15
5	EDO	C	610	4/4	0.79	0.26	32,37,46,47	0
5	EDO	B	607	4/4	0.79	0.20	33,36,48,63	0
5	EDO	B	611	4/4	0.80	0.20	30,39,43,47	0
5	EDO	C	613	4/4	0.81	0.16	38,39,40,41	0
5	EDO	A	713	4/4	0.81	0.15	42,42,42,57	0
5	EDO	D	706	4/4	0.82	0.16	39,42,44,45	0
5	EDO	C	606	4/4	0.84	0.15	34,36,38,43	0
5	EDO	D	707	4/4	0.84	0.14	49,49,52,54	0
5	EDO	A	711	4/4	0.84	0.17	38,39,44,47	0
5	EDO	C	611	4/4	0.85	0.18	22,24,26,31	4
4	UMP	B	602	20/20	0.85	0.11	27,42,48,49	0
5	EDO	C	614	4/4	0.85	0.16	38,39,49,53	0
5	EDO	B	608	4/4	0.85	0.14	39,39,41,48	0
5	EDO	C	609	4/4	0.85	0.13	32,34,39,39	0
5	EDO	A	717	4/4	0.85	0.12	46,46,47,54	0
5	EDO	C	607	4/4	0.86	0.16	36,38,40,42	0
5	EDO	B	606	4/4	0.86	0.14	37,38,39,42	0
5	EDO	D	711	4/4	0.86	0.14	49,52,52,62	0
5	EDO	B	610	4/4	0.87	0.13	47,51,54,56	0
5	EDO	D	708	4/4	0.87	0.18	29,32,35,38	0
5	EDO	B	614	4/4	0.88	0.10	41,42,45,54	0
5	EDO	B	604	4/4	0.88	0.12	33,36,36,37	0
5	EDO	B	612	4/4	0.89	0.18	34,39,40,41	0
5	EDO	B	613	4/4	0.89	0.13	38,45,48,52	0
5	EDO	A	716	4/4	0.89	0.12	34,40,42,43	0
3	THG	A	702	32/32	0.89	0.10	24,38,50,55	0
3	THG	B	601	32/32	0.90	0.09	24,36,44,54	0
5	EDO	A	709	4/4	0.90	0.13	30,31,43,55	0
5	EDO	B	609	4/4	0.90	0.14	34,47,48,49	0
5	EDO	D	713	4/4	0.90	0.12	30,35,36,38	0
3	THG	C	601	32/32	0.91	0.10	27,44,53,55	0
5	EDO	A	704	4/4	0.91	0.10	27,30,30,34	0
5	EDO	C	605	4/4	0.91	0.10	36,38,43,51	0
5	EDO	D	705	4/4	0.91	0.14	31,43,43,51	0
5	EDO	A	708	4/4	0.91	0.12	37,41,43,54	0

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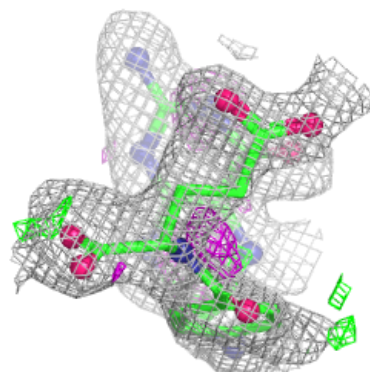
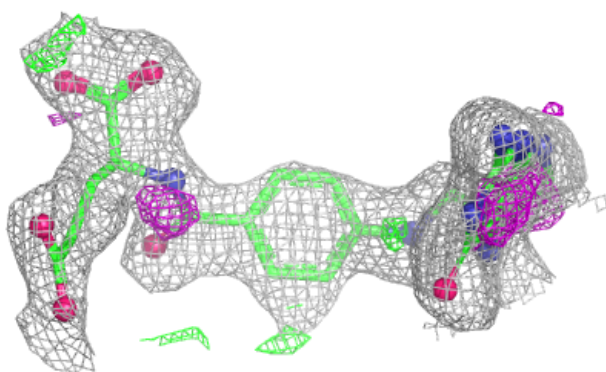
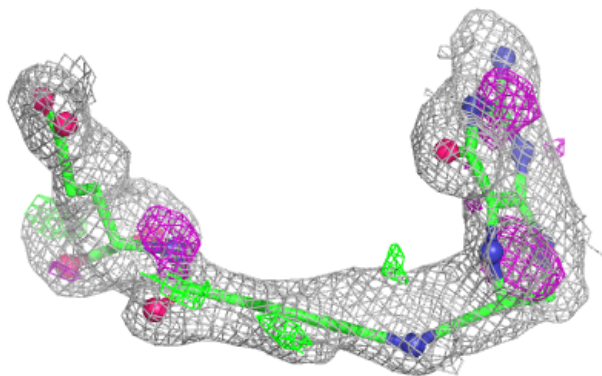
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
5	EDO	D	712	4/4	0.92	0.10	27,32,33,42	0
2	NAP	D	701	48/48	0.92	0.12	31,37,112,117	0
5	EDO	B	605	4/4	0.93	0.08	23,23,24,25	0
5	EDO	A	710	4/4	0.93	0.10	28,29,36,44	0
5	EDO	A	712	4/4	0.93	0.09	35,43,46,54	0
5	EDO	C	604	4/4	0.94	0.07	21,21,22,22	0
5	EDO	A	707	4/4	0.94	0.10	31,32,32,45	0
5	EDO	D	709	4/4	0.95	0.08	24,25,28,29	0
2	NAP	A	701	48/48	0.96	0.10	25,31,88,97	0
5	EDO	A	706	4/4	0.96	0.06	22,23,23,26	0
5	EDO	D	704	4/4	0.96	0.07	21,22,23,25	0
2	NAP	B	603	48/48	0.96	0.10	23,30,95,101	0
2	NAP	C	602	48/48	0.96	0.10	25,32,101,111	0
5	EDO	C	612	4/4	0.96	0.07	23,24,25,27	0
5	EDO	B	615	4/4	0.97	0.06	26,26,27,29	0
5	EDO	A	705	4/4	0.97	0.06	20,22,22,23	0

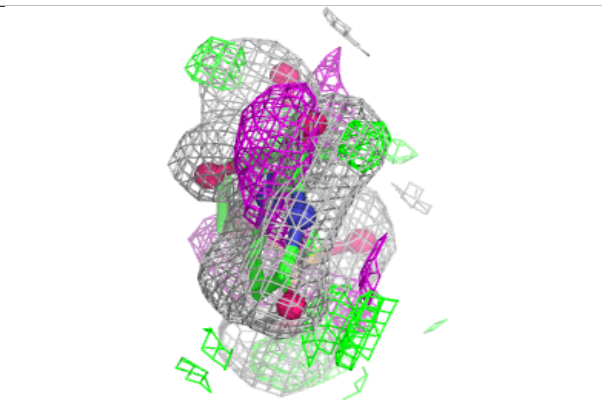
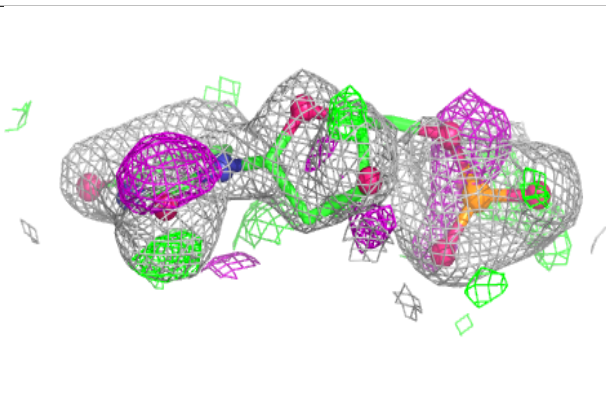
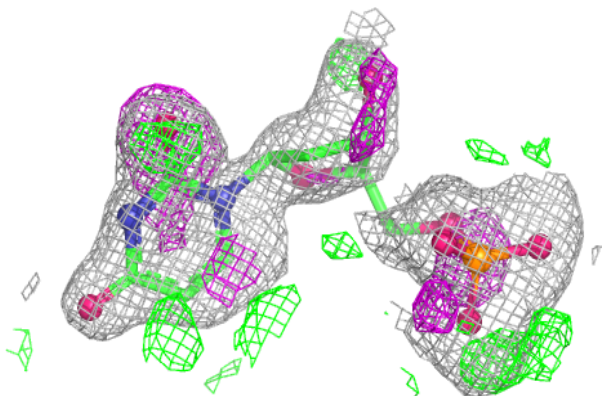
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around THG D 703:

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

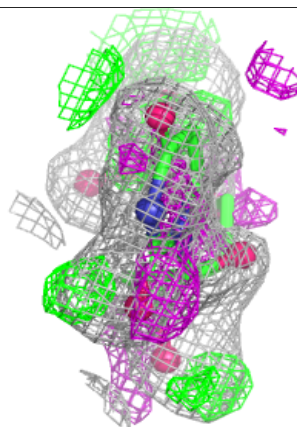
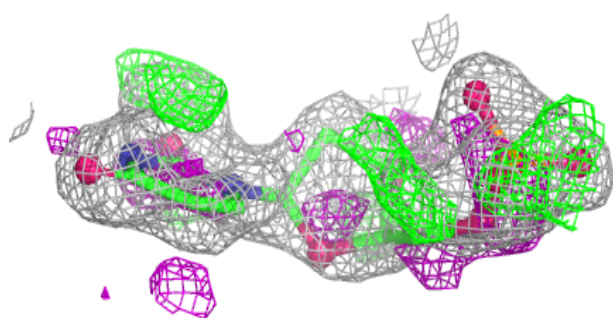
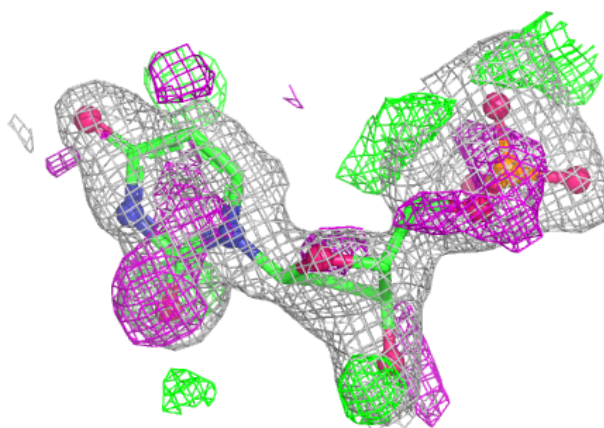
**Electron density around UMP D 702:**

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

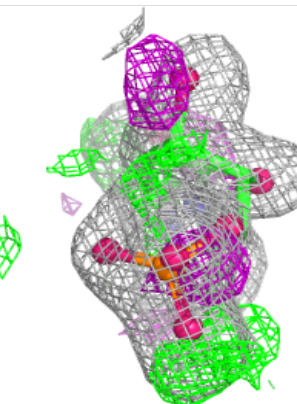
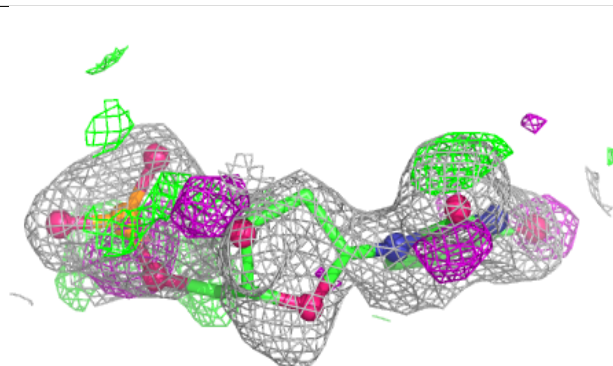
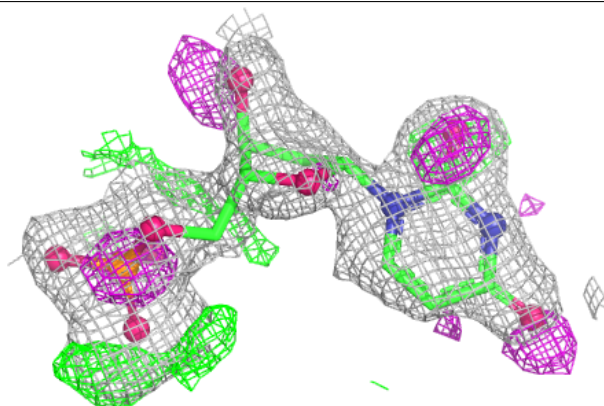


Electron density around UMP C 603:

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

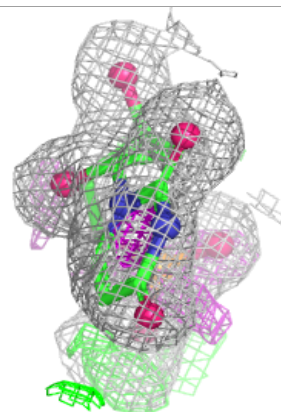
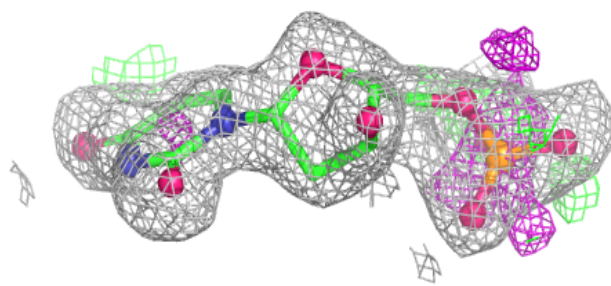
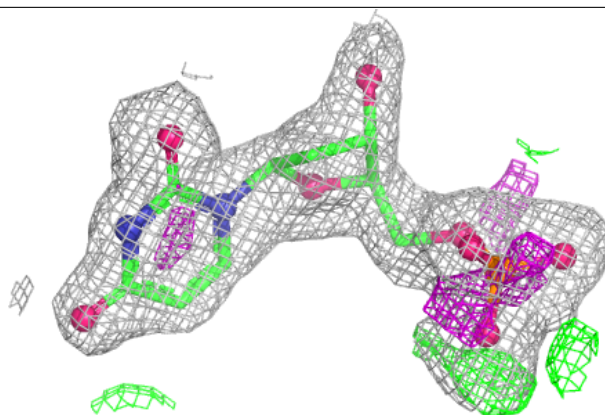
**Electron density around UMP A 703:**

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

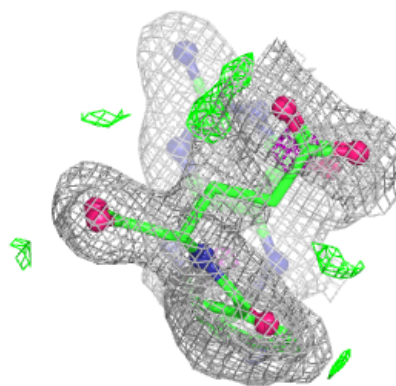
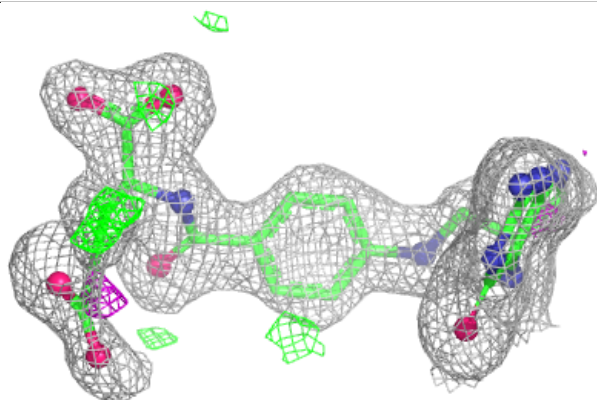
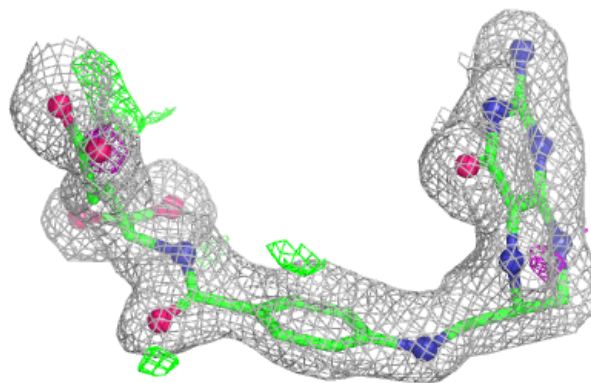


Electron density around UMP B 602:

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

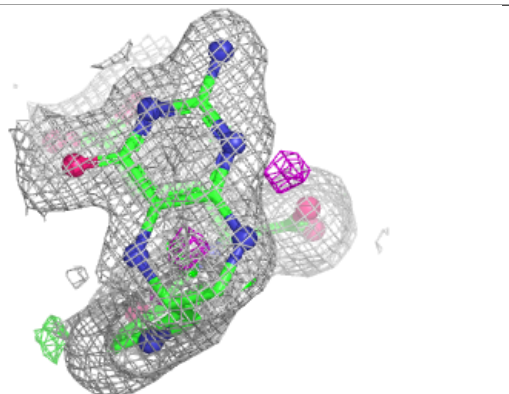
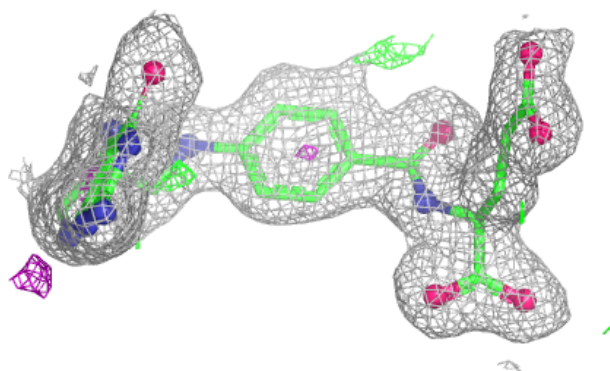
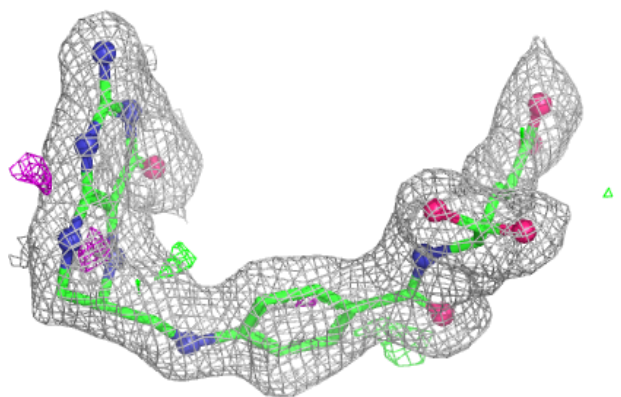
**Electron density around THG A 702:**

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

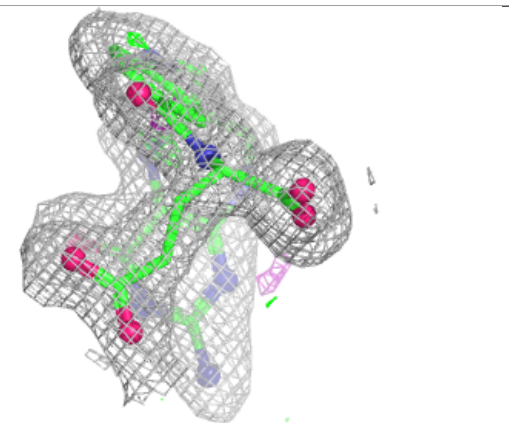
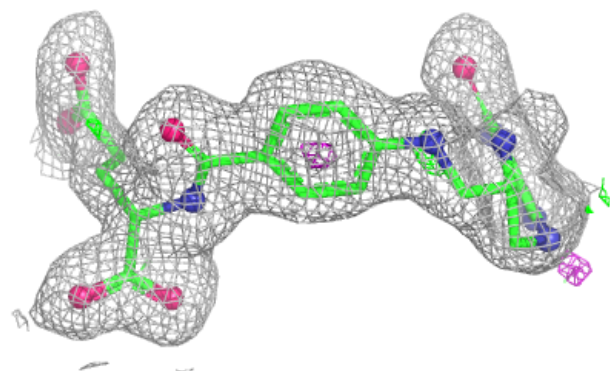
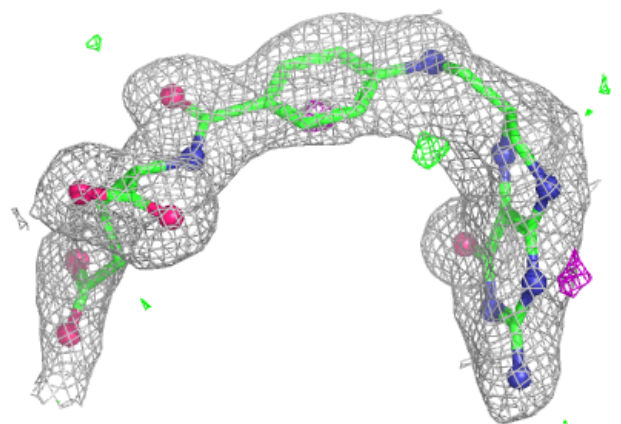


Electron density around THG B 601:

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

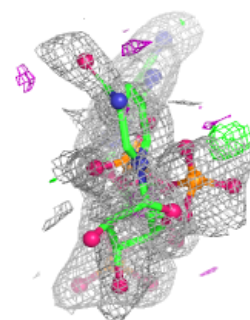
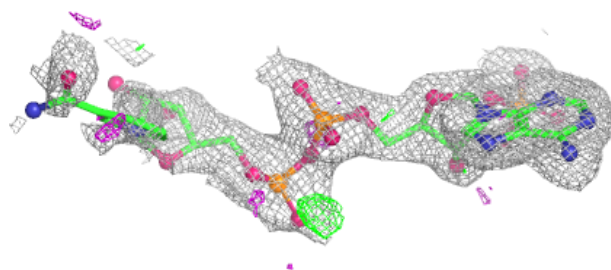
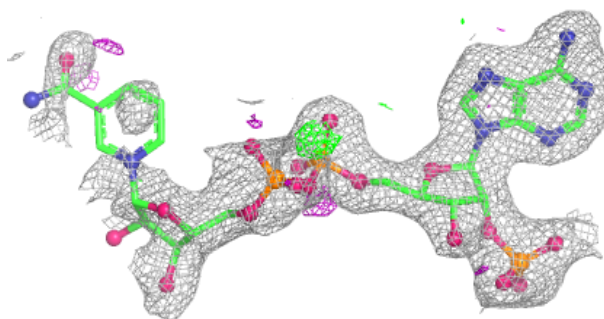
**Electron density around THG C 601:**

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

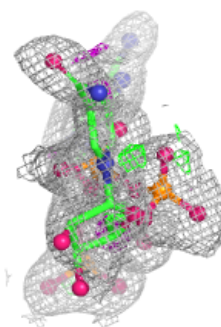
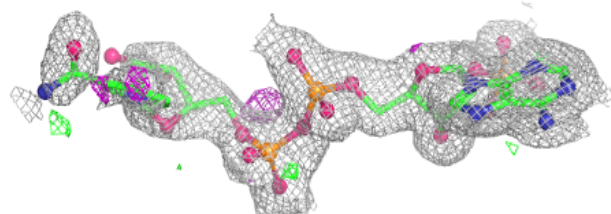
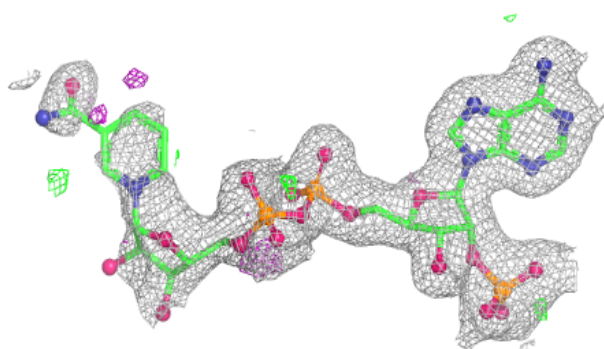


Electron density around NAP D 701:

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

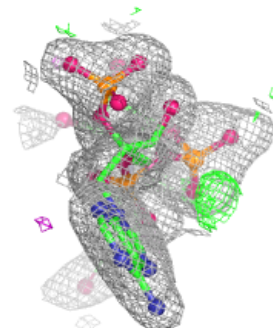
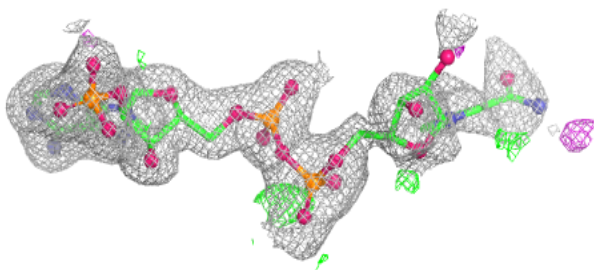
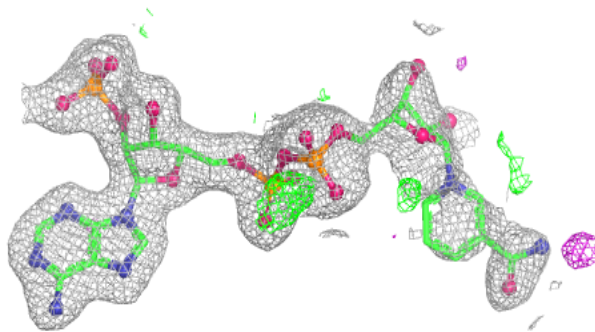
**Electron density around NAP A 701:**

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

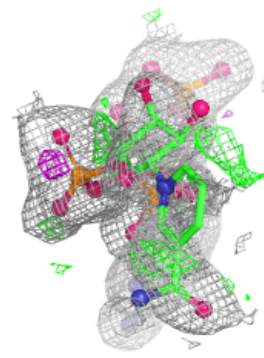
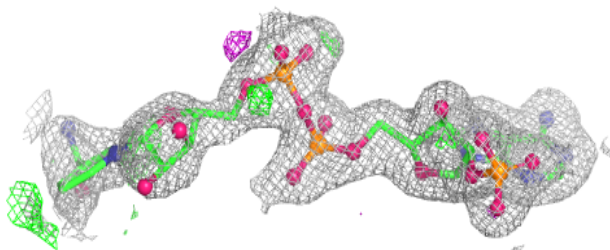
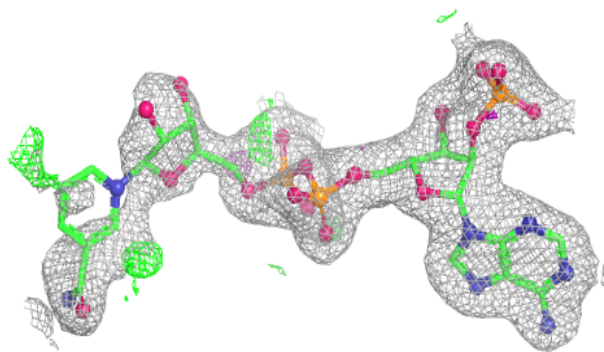


Electron density around NAP B 603:

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

**Electron density around NAP C 602:**

$2mF_o-DF_c$ (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.