



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 17, 2026 – 10:38 PM UTC

PDB ID : 5EJ9 / pdb_00005ej9
Title : EcMenD-ThDP-Mn²⁺ complex soaked with 2-ketoglutarate for 2 min and isochorismate for 13 min
Authors : Song, H.G.; Dong, C.; Chen, Y.Z.; Sun, Y.R.; Guo, Z.H.
Deposited on : 2015-11-01
Resolution : 1.72 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

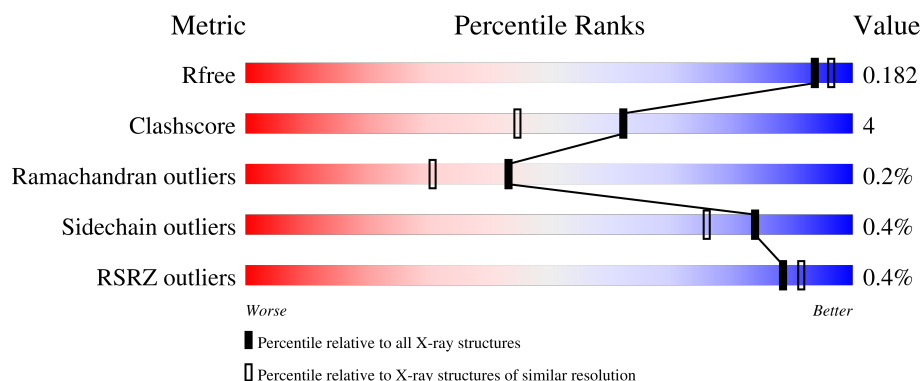
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.72 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.



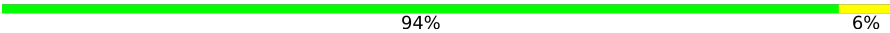
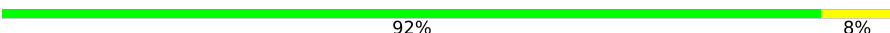
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	1039 (1.72-1.72)
Clashscore	190562	1049 (1.72-1.72)
Ramachandran outliers	187476	1041 (1.72-1.72)
Sidechain outliers	187428	1041 (1.72-1.72)
RSRZ outliers	180081	1039 (1.72-1.72)

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	556	% 91% 8%
1	B	556	% 93% 7%
1	C	556	91% 9%
1	D	556	% 92% 8%
1	E	556	% 92% 8%

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Mol	Chain	Length	Quality of chain
1	F	556	 94% 6%
1	G	556	 92% 7%
1	H	556	 92% 8%

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
5	FMT	E	604	-	-	X	-

2 Entry composition

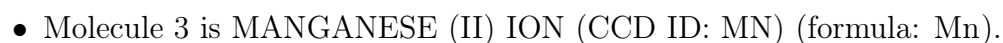
There are 6 unique types of molecules in this entry. The entry contains 40605 atoms, of which 208 are hydrogens and 0 are deuteriums.

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 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylate synthase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	556	Total	C	N	O	S	0	7	0
			4373	2772	790	796	15			
1	B	556	Total	C	N	O	S	0	3	0
			4329	2748	777	790	14			
1	C	556	Total	C	N	O	S	0	6	0
			4352	2762	786	790	14			
1	D	556	Total	C	N	O	S	0	3	0
			4308	2736	773	785	14			
1	E	556	Total	C	N	O	S	0	6	0
			4356	2763	784	794	15			
1	F	556	Total	C	N	O	S	0	4	0
			4337	2754	780	789	14			
1	G	556	Total	C	N	O	S	0	5	0
			4344	2755	784	791	14			
1	H	556	Total	C	N	O	S	0	3	0
			4313	2740	773	786	14			

- Molecule 2 is THIAMINE DIPHOSPHATE (CCD ID: TPP) (formula: C₁₂H₁₉N₄O₇P₂S).



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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	E	1	Total 1	Mn 1	0	0
3	F	1	Total 1	Mn 1	0	0
3	G	1	Total 1	Mn 1	0	0
3	H	1	Total 1	Mn 1	0	0

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



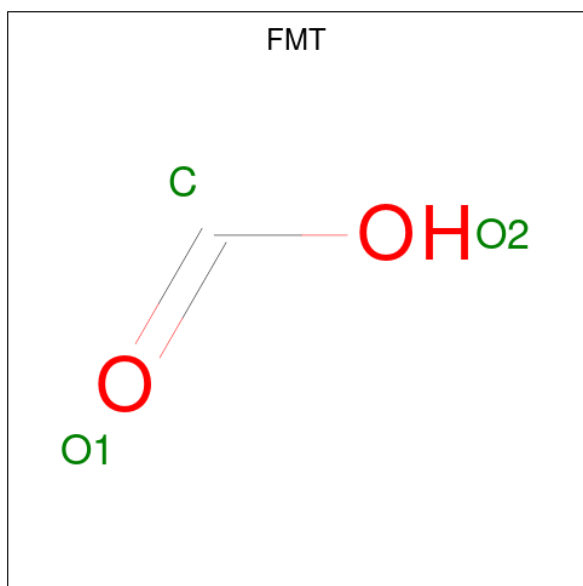
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total 14	C 3	H 8	O 3	0	0
4	B	1	Total 14	C 3	H 8	O 3	0	0
4	C	1	Total 14	C 3	H 8	O 3	0	0
4	D	1	Total 14	C 3	H 8	O 3	0	0
4	E	1	Total 14	C 3	H 8	O 3	0	0
4	F	1	Total 14	C 3	H 8	O 3	0	0
4	G	1	Total 14	C 3	H 8	O 3	0	0

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	H	1	Total	C	H	O	0	0
			14	3	8	3		

- Molecule 5 is FORMIC ACID (CCD ID: FMT) (formula: CH₂O₂).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total	C	H	O	0	0
			5	1	2	2		
5	B	1	Total	C	H	O	0	0
			5	1	2	2		
5	C	1	Total	C	H	O	0	0
			5	1	2	2		
5	D	1	Total	C	H	O	0	0
			5	1	2	2		
5	E	1	Total	C	H	O	0	0
			5	1	2	2		
5	F	1	Total	C	H	O	0	0
			5	1	2	2		
5	G	1	Total	C	H	O	0	0
			5	1	2	2		
5	H	1	Total	C	H	O	0	0
			5	1	2	2		

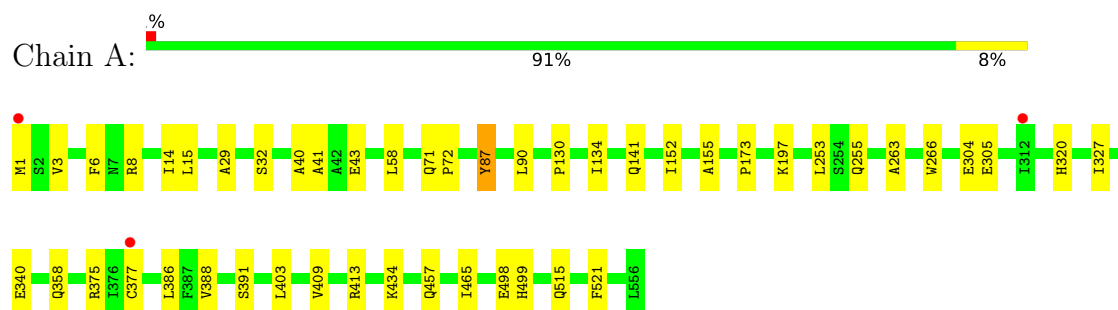
- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	737	Total O 737 737	0	0
6	B	669	Total O 669 669	0	0
6	C	676	Total O 676 676	0	0
6	D	592	Total O 592 592	0	0
6	E	712	Total O 712 712	0	0
6	F	682	Total O 682 682	0	0
6	G	714	Total O 714 714	0	0
6	H	615	Total O 615 615	0	0

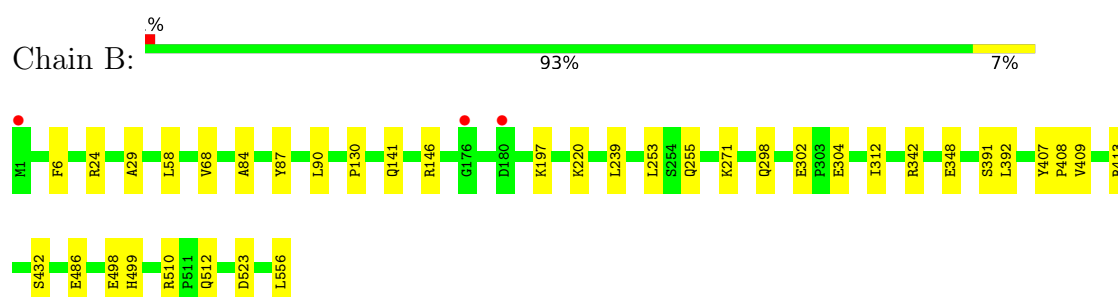
3 Residue-property plots [i](#)

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.

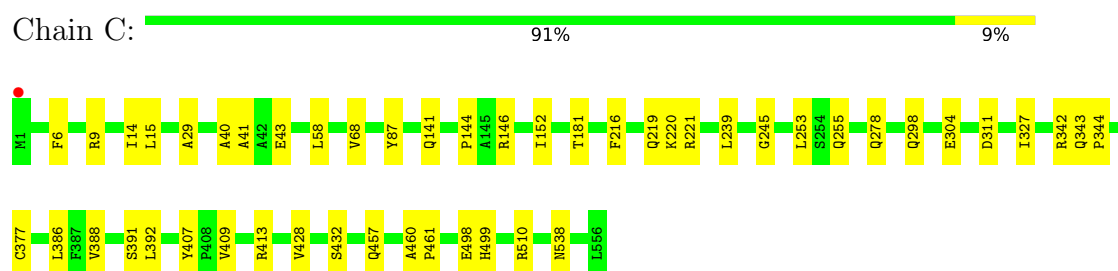
- Molecule 1: 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylate synthase



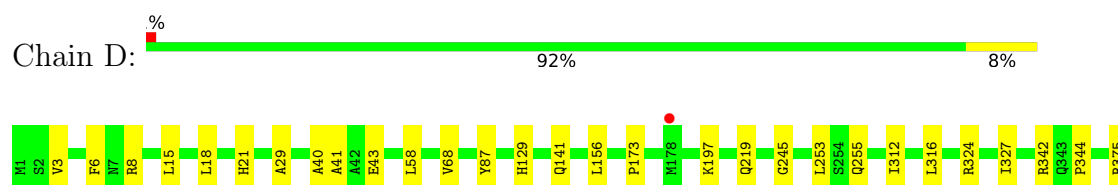
- Molecule 1: 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylate synthase



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- Molecule 1: 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylate synthase



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	90.72Å 90.72Å 169.47Å 76.06° 83.35° 64.38°	Depositor
Resolution (Å)	39.96 – 1.72 39.96 – 1.72	Depositor EDS
% Data completeness (in resolution range)	96.5 (39.96-1.72) 95.1 (39.96-1.72)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.97 (at 1.72Å)	Xtriage
Refinement program	PHENIX 1.9_1692	Depositor
R, R_{free}	0.151 , 0.182 0.152 , 0.182	Depositor DCC
R_{free} test set	23966 reflections (4.75%)	wwPDB-VP
Wilson B-factor (Å ²)	14.4	Xtriage
Anisotropy	0.327	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 54.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.27$	Xtriage
Estimated twinning fraction	0.036 for -h,-k,-k+l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	40605	wwPDB-VP
Average B, all atoms (Å ²)	19.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.13% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: TPP, MN, GOL, FMT

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	A	0.43	0/4482	0.72	0/6116
1	B	0.43	0/4438	0.72	0/6059
1	C	0.43	0/4461	0.72	0/6089
1	D	0.41	0/4417	0.73	2/6034 (0.0%)
1	E	0.43	0/4465	0.72	0/6094
1	F	0.43	0/4446	0.71	0/6068
1	G	0.43	0/4453	0.71	0/6078
1	H	0.41	0/4422	0.71	0/6039
All	All	0.42	0/35584	0.72	2/48577 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	129	HIS	CA-C-N	-5.06	114.74	119.85
1	D	129	HIS	C-N-CA	-5.06	114.74	119.85

There are no chirality outliers.

There are no planarity outliers.

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	4373	0	4321	42	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	4329	0	4258	31	0
1	C	4352	0	4294	44	0
1	D	4308	0	4230	38	0
1	E	4356	0	4292	36	0
1	F	4337	0	4278	30	0
1	G	4344	0	4283	27	0
1	H	4313	0	4241	38	0
2	A	26	16	16	0	0
2	B	26	16	16	1	0
2	C	26	16	16	2	0
2	D	26	16	16	1	0
2	E	26	16	16	1	0
2	F	26	16	16	1	0
2	G	26	16	16	0	0
2	H	26	16	16	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	F	1	0	0	0	0
3	G	1	0	0	0	0
3	H	1	0	0	0	0
4	A	6	8	8	0	0
4	B	6	8	8	0	0
4	C	6	8	8	0	0
4	D	6	8	8	0	0
4	E	6	8	8	0	0
4	F	6	8	8	0	0
4	G	6	8	8	0	0
4	H	6	8	8	0	0
5	A	3	2	1	1	0
5	B	3	2	1	0	0
5	C	3	2	1	0	0
5	D	3	2	1	0	0
5	E	3	2	1	2	0
5	F	3	2	1	0	0
5	G	3	2	1	1	0
5	H	3	2	1	0	0
6	A	737	0	0	12	0
6	B	669	0	0	14	0
6	C	676	0	0	13	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	D	592	0	0	5	0
6	E	712	0	0	11	0
6	F	682	0	0	8	4
6	G	714	0	0	8	4
6	H	615	0	0	14	0
All	All	40397	208	34397	285	4

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 4.

The worst 5 of 285 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:H:255:GLN:HE21	1:H:409:VAL:H	1.21	0.89
1:D:255:GLN:HE21	1:D:409:VAL:H	1.19	0.88
1:B:146[B]:ARG:HG2	1:B:146[B]:ARG:HH11	1.41	0.86
1:B:255:GLN:HE21	1:B:409:VAL:H	1.23	0.85
1:A:15[A]:LEU:HD12	1:A:40:ALA:HB3	1.57	0.85

All (4) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
6:F:762:HOH:O	6:G:1286:HOH:O[1_465]	2.05	0.15
6:F:1296:HOH:O	6:G:1286:HOH:O[1_465]	2.08	0.12
6:F:760:HOH:O	6:G:1286:HOH:O[1_465]	2.13	0.07
6:F:759:HOH:O	6:G:1286:HOH:O[1_465]	2.14	0.06

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	561/556 (101%)	550 (98%)	10 (2%)	1 (0%)	43	31
1	B	557/556 (100%)	546 (98%)	10 (2%)	1 (0%)	43	31
1	C	560/556 (101%)	549 (98%)	10 (2%)	1 (0%)	43	31
1	D	557/556 (100%)	546 (98%)	10 (2%)	1 (0%)	43	31
1	E	560/556 (101%)	548 (98%)	11 (2%)	1 (0%)	43	31
1	F	558/556 (100%)	547 (98%)	10 (2%)	1 (0%)	43	31
1	G	559/556 (100%)	548 (98%)	10 (2%)	1 (0%)	43	31
1	H	557/556 (100%)	544 (98%)	12 (2%)	1 (0%)	43	31
All	All	4469/4448 (100%)	4378 (98%)	83 (2%)	8 (0%)	43	31

5 of 8 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	391	SER
1	B	391	SER
1	C	391	SER
1	F	391	SER
1	G	391	SER

5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	455/452 (101%)	454 (100%)	1 (0%)	87	81
1	B	446/452 (99%)	445 (100%)	1 (0%)	87	81
1	C	450/452 (100%)	449 (100%)	1 (0%)	87	81
1	D	443/452 (98%)	441 (100%)	2 (0%)	81	71
1	E	451/452 (100%)	449 (100%)	2 (0%)	84	76
1	F	448/452 (99%)	447 (100%)	1 (0%)	87	81
1	G	450/452 (100%)	446 (99%)	4 (1%)	70	57
1	H	444/452 (98%)	442 (100%)	2 (0%)	81	71

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	3587/3616 (99%)	3573 (100%)	14 (0%)	84 76

5 of 14 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	F	87	TYR
1	G	35	THR
1	H	197	LYS
1	G	391	SER
1	H	87	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 39 such sidechains are listed below:

Mol	Chain	Res	Type
1	G	255	GLN
1	H	255	GLN
1	G	278	GLN
1	G	493	GLN
1	H	355	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 [i](#)

Of 32 ligands modelled in this entry, 8 are monoatomic - leaving 24 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	TPP	H	602	3	26,27,27	1.66	7 (26%)	38,40,40	1.59	7 (18%)
5	FMT	D	601	-	2,2,2	0.81	0	1,1,1	0.47	0
5	FMT	C	604	-	2,2,2	0.81	0	1,1,1	0.45	0
2	TPP	G	601	3	26,27,27	1.69	7 (26%)	38,40,40	1.59	7 (18%)
5	FMT	A	604	-	2,2,2	0.65	0	1,1,1	0.31	0
2	TPP	A	601	3	26,27,27	1.60	7 (26%)	38,40,40	1.52	7 (18%)
2	TPP	F	602	3	26,27,27	1.69	7 (26%)	38,40,40	1.64	8 (21%)
4	GOL	E	603	-	5,5,5	0.37	0	5,5,5	0.51	0
4	GOL	C	603	-	5,5,5	0.41	0	5,5,5	0.45	0
5	FMT	B	601	-	2,2,2	0.73	0	1,1,1	0.42	0
5	FMT	H	601	-	2,2,2	0.83	0	1,1,1	0.44	0
4	GOL	D	604	-	5,5,5	0.35	0	5,5,5	0.35	0
4	GOL	F	604	-	5,5,5	0.32	0	5,5,5	0.59	0
5	FMT	E	604	-	2,2,2	0.77	0	1,1,1	0.35	0
4	GOL	G	603	-	5,5,5	0.39	0	5,5,5	0.49	0
2	TPP	B	602	3	26,27,27	1.68	7 (26%)	38,40,40	1.54	7 (18%)
5	FMT	F	601	-	2,2,2	0.77	0	1,1,1	0.47	0
4	GOL	A	603	-	5,5,5	0.37	0	5,5,5	0.50	0
2	TPP	D	602	3	26,27,27	1.69	9 (34%)	38,40,40	1.67	9 (23%)
4	GOL	B	604	-	5,5,5	0.32	0	5,5,5	0.68	0
2	TPP	E	601	3	26,27,27	1.63	7 (26%)	38,40,40	1.55	9 (23%)
2	TPP	C	601	3	26,27,27	1.68	7 (26%)	38,40,40	1.55	8 (21%)
4	GOL	H	604	-	5,5,5	0.35	0	5,5,5	0.33	0
5	FMT	G	604	-	2,2,2	0.82	0	1,1,1	0.47	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
2	TPP	H	602	3	-	0/17/17/17	0/2/2/2
4	GOL	C	603	-	-	0/4/4/4	-
4	GOL	G	603	-	-	0/4/4/4	-
2	TPP	B	602	3	-	0/17/17/17	0/2/2/2
4	GOL	D	604	-	-	0/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	TPP	G	601	3	-	0/17/17/17	0/2/2/2
4	GOL	A	603	-	-	0/4/4/4	-
2	TPP	D	602	3	-	0/17/17/17	0/2/2/2
2	TPP	A	601	3	-	0/17/17/17	0/2/2/2
2	TPP	F	602	3	-	0/17/17/17	0/2/2/2
4	GOL	H	604	-	-	0/4/4/4	-
4	GOL	E	603	-	-	0/4/4/4	-
4	GOL	B	604	-	-	0/4/4/4	-
2	TPP	E	601	3	-	0/17/17/17	0/2/2/2
4	GOL	F	604	-	-	0/4/4/4	-
2	TPP	C	601	3	-	0/17/17/17	0/2/2/2

The worst 5 of 58 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	602	TPP	C5-S1	-4.41	1.61	1.72
2	F	602	TPP	C5-S1	-4.37	1.61	1.72
2	B	602	TPP	C5-S1	-4.34	1.61	1.72
2	G	601	TPP	C5-S1	-4.28	1.61	1.72
2	H	602	TPP	C5-S1	-4.22	1.61	1.72

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	602	TPP	CM2-C2'-N1'	4.87	122.39	117.20
2	G	601	TPP	CM2-C2'-N1'	4.66	122.16	117.20
2	F	602	TPP	CM2-C2'-N1'	4.46	121.94	117.20
2	B	602	TPP	CM2-C2'-N1'	4.43	121.91	117.20
2	D	602	TPP	CM2-C2'-N1'	4.42	121.91	117.20

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

9 monomers are involved in 11 short contacts:

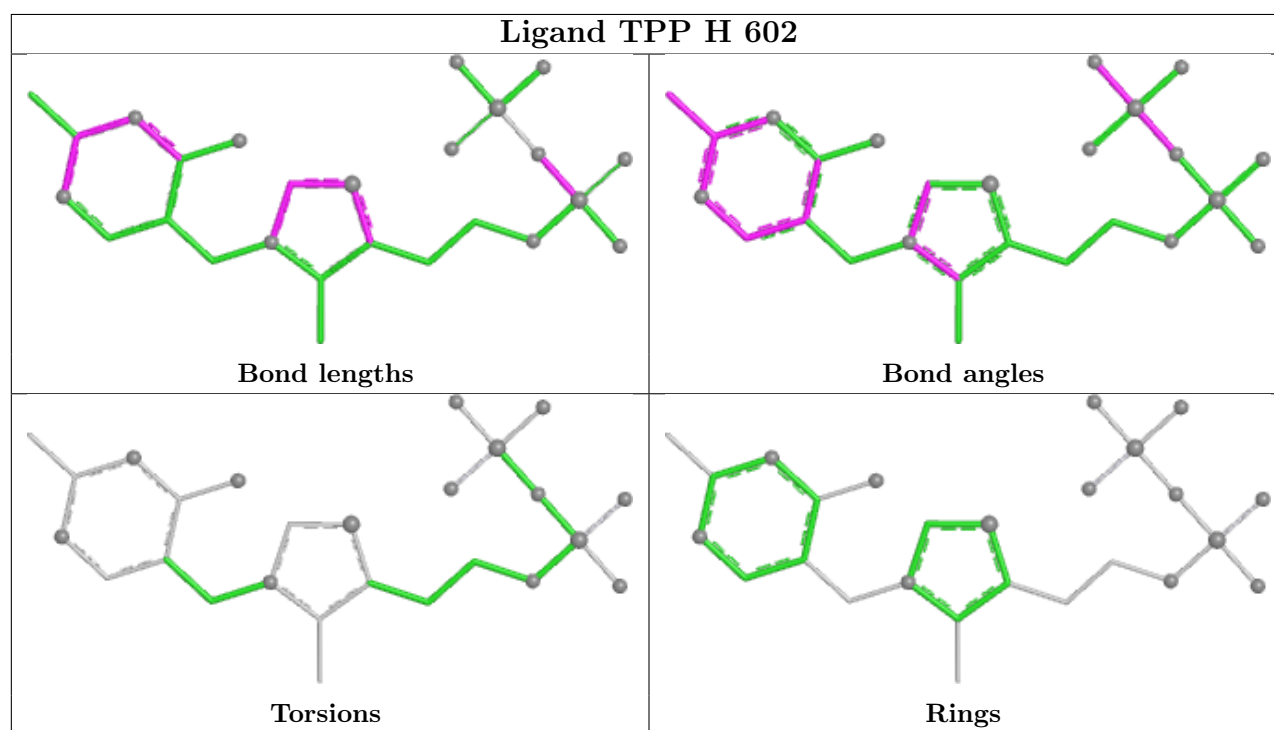
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	H	602	TPP	1	0
5	A	604	FMT	1	0
2	F	602	TPP	1	0
5	E	604	FMT	2	0
2	B	602	TPP	1	0

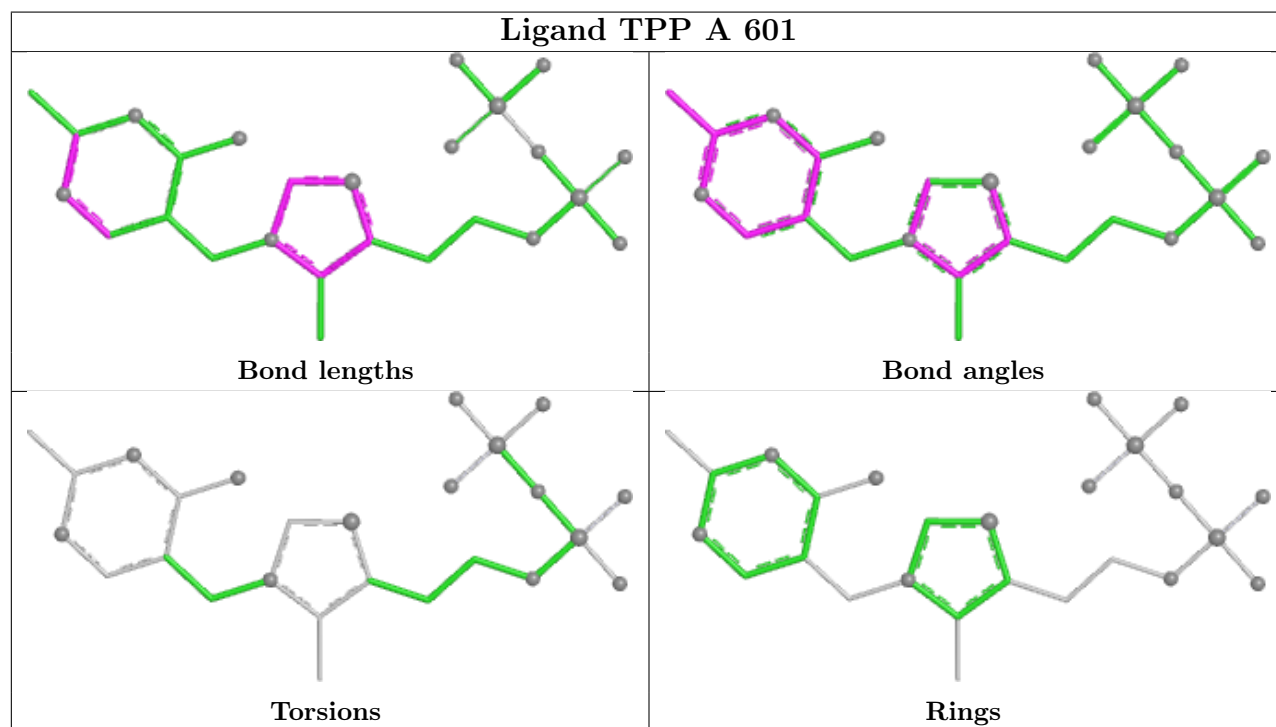
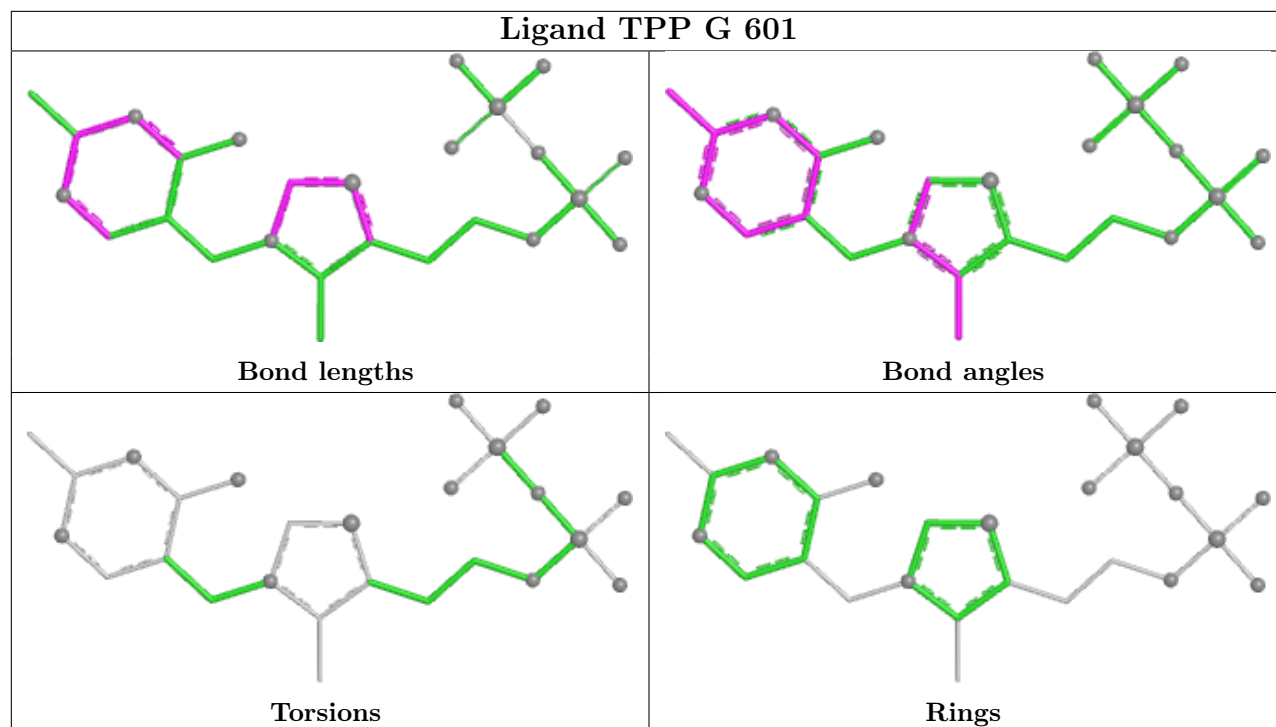
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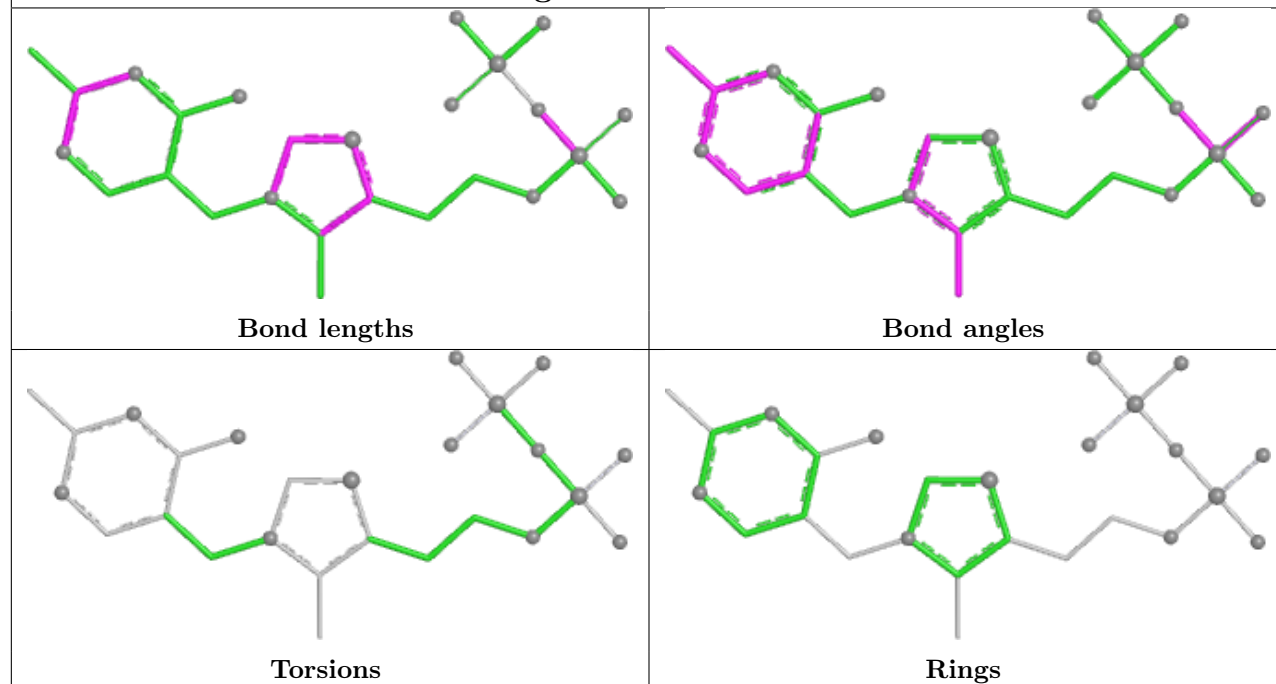
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	602	TPP	1	0
2	E	601	TPP	1	0
2	C	601	TPP	2	0
5	G	604	FMT	1	0

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.

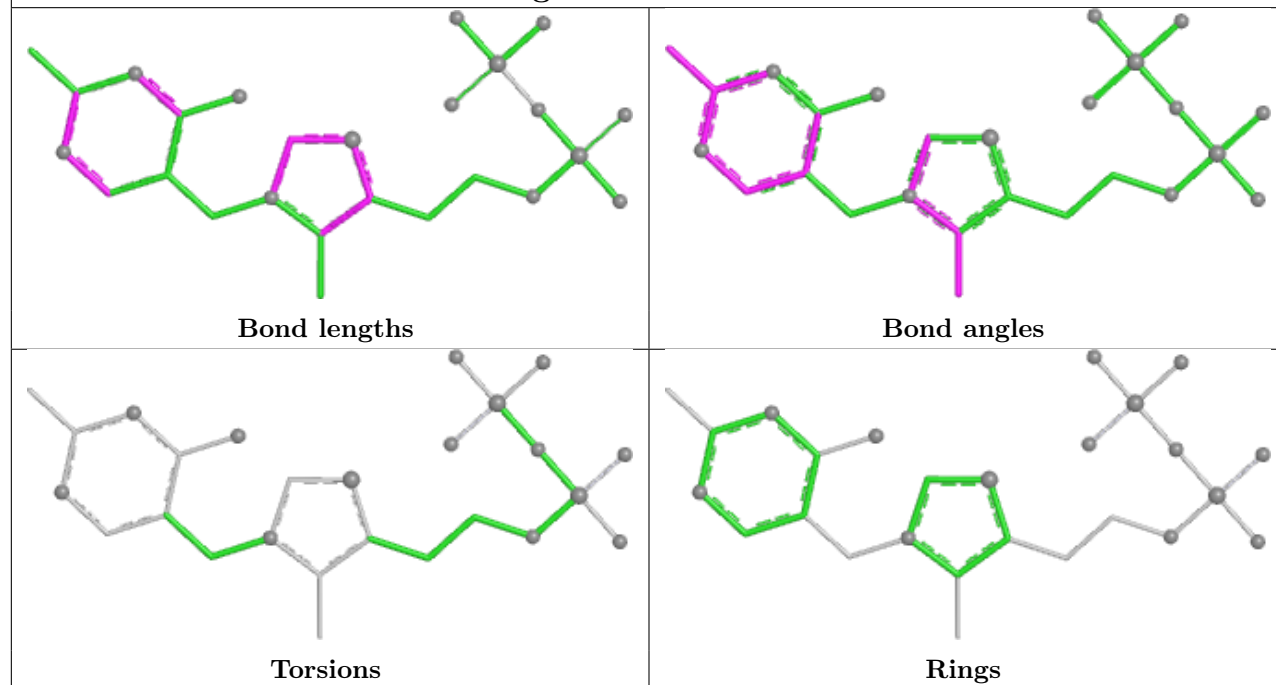




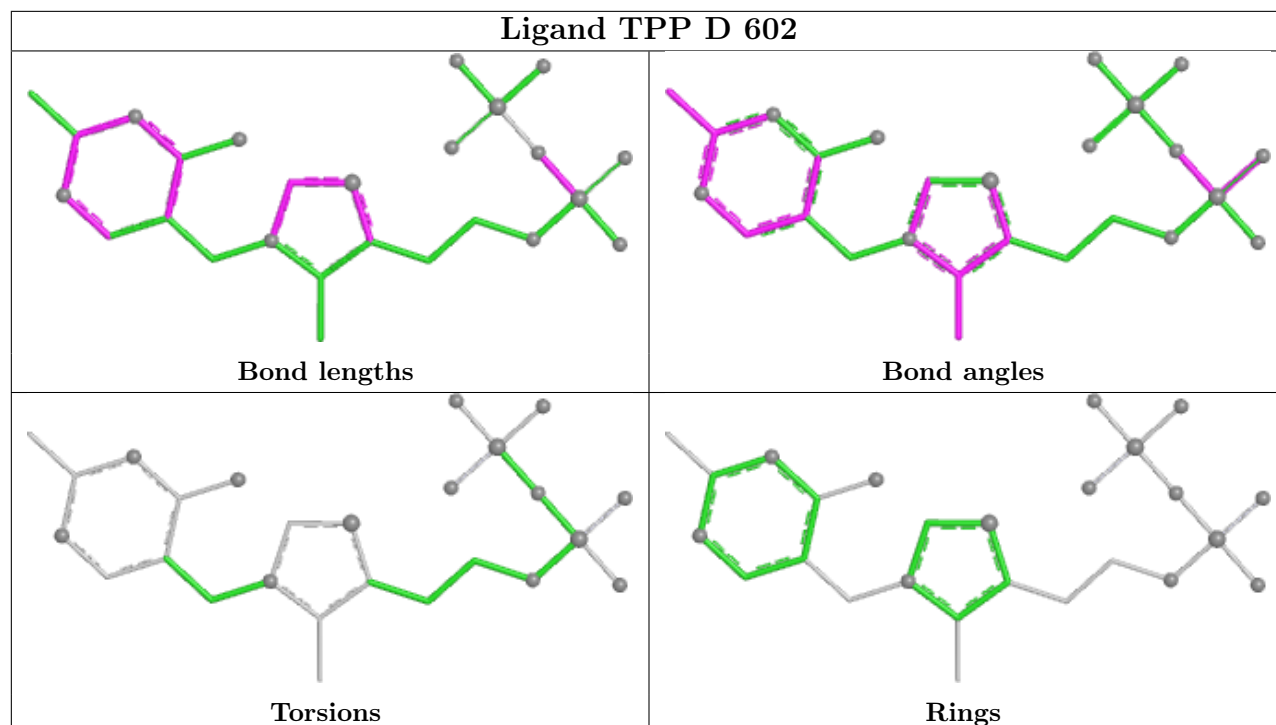
Ligand TPP F 602



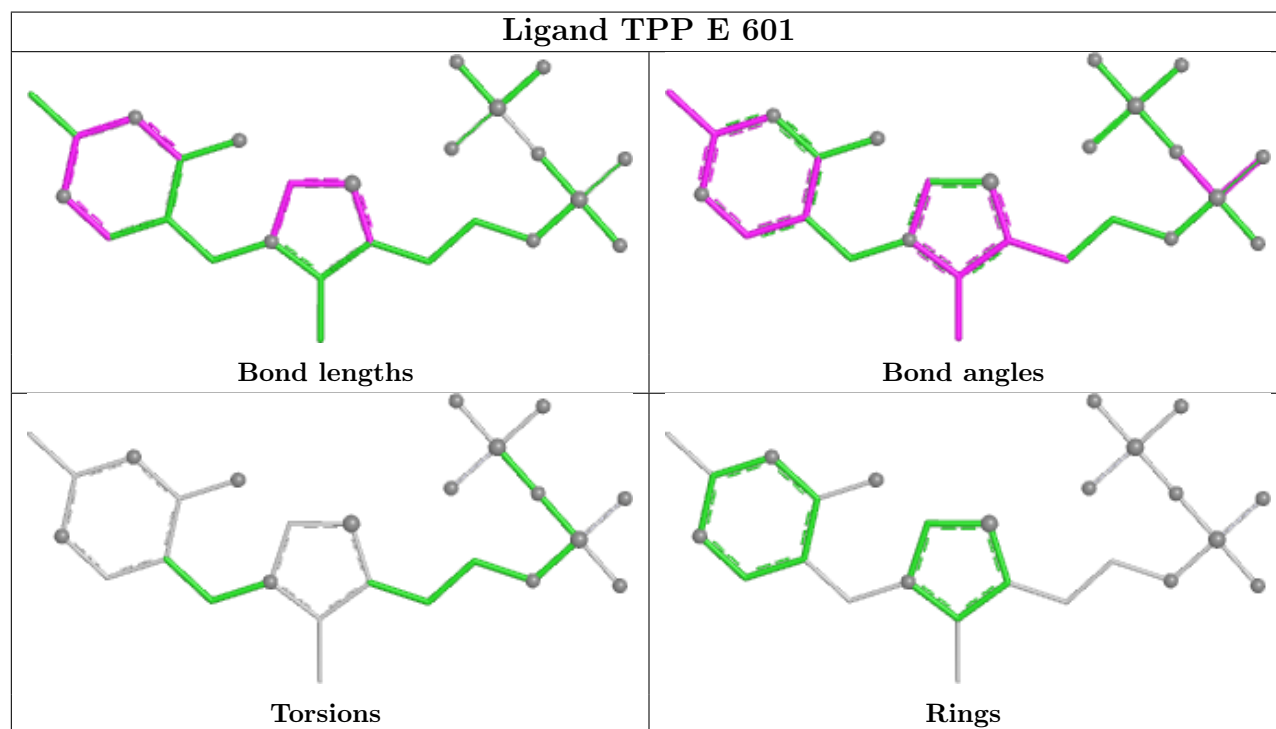
Ligand TPP B 602

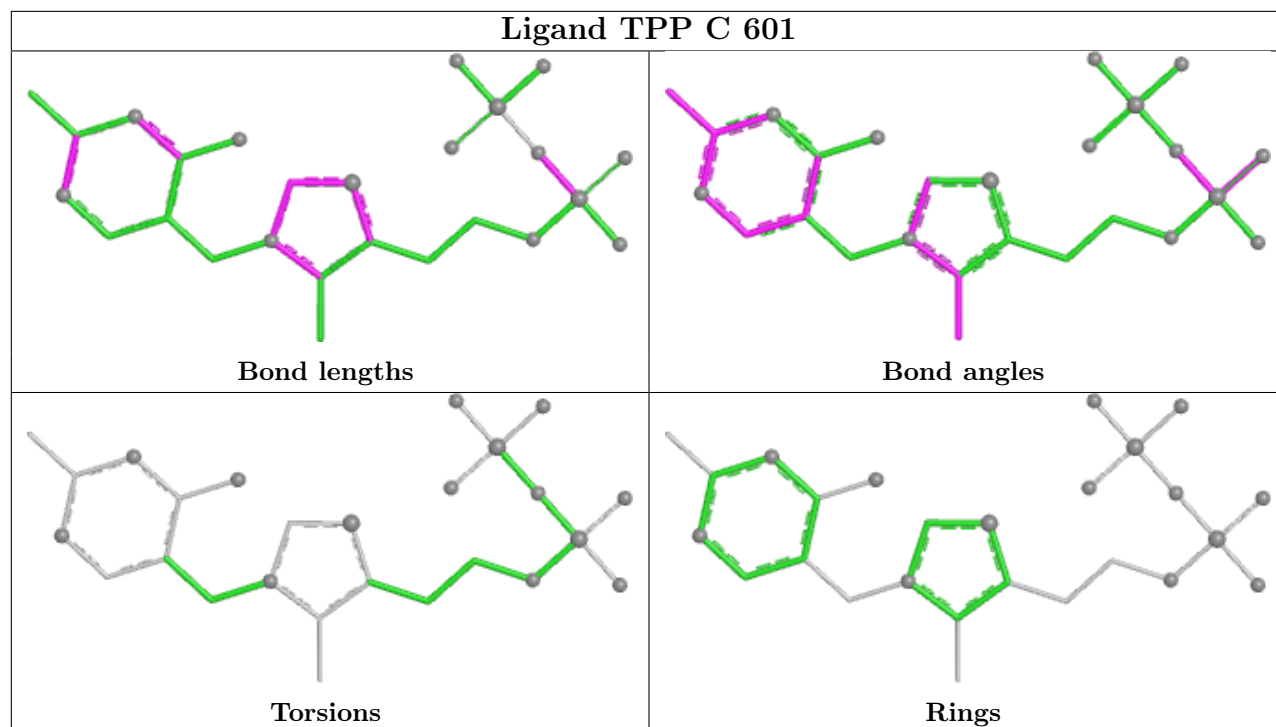


Ligand TPP D 602



Ligand TPP E 601





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	556/556 (100%)	-0.41	3 (0%) 87 90	6, 14, 27, 44	7 (1%)
1	B	556/556 (100%)	-0.41	3 (0%) 87 90	7, 15, 26, 43	3 (0%)
1	C	556/556 (100%)	-0.37	1 (0%) 91 93	7, 15, 28, 43	6 (1%)
1	D	556/556 (100%)	-0.23	4 (0%) 84 88	7, 18, 34, 57	3 (0%)
1	E	556/556 (100%)	-0.39	4 (0%) 84 88	6, 14, 28, 47	6 (1%)
1	F	556/556 (100%)	-0.41	2 (0%) 88 91	7, 15, 25, 43	4 (0%)
1	G	556/556 (100%)	-0.37	1 (0%) 91 93	7, 15, 28, 43	5 (0%)
1	H	556/556 (100%)	-0.30	0 100 100	7, 17, 31, 45	3 (0%)
All	All	4448/4448 (100%)	-0.36	18 (0%) 88 91	6, 15, 29, 57	37 (0%)

The worst 5 of 18 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	176	GLY	3.2
1	E	1	MET	3.0
1	A	377[A]	CYS	3.0
1	F	1	MET	2.9
1	D	556	LEU	2.9

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

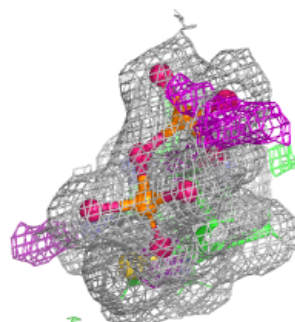
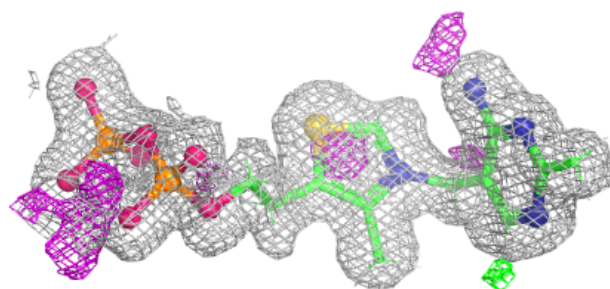
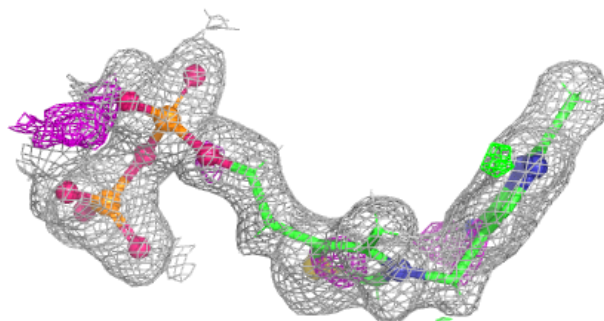
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
5	FMT	A	604	3/3	0.92	0.10	20,21,24,25	0
5	FMT	G	604	3/3	0.92	0.12	21,22,26,30	0
4	GOL	C	603	6/6	0.94	0.09	18,29,34,35	0
4	GOL	B	604	6/6	0.95	0.07	17,23,28,28	0
5	FMT	E	604	3/3	0.95	0.07	17,20,24,25	0
4	GOL	D	604	6/6	0.95	0.08	20,29,35,37	0
5	FMT	H	601	3/3	0.95	0.08	20,22,26,27	0
4	GOL	A	603	6/6	0.96	0.09	16,23,28,28	0
5	FMT	C	604	3/3	0.96	0.07	18,19,22,25	0
4	GOL	E	603	6/6	0.96	0.08	12,22,28,28	0
4	GOL	G	603	6/6	0.96	0.09	16,28,35,35	0
4	GOL	H	604	6/6	0.96	0.07	17,28,34,34	0
5	FMT	F	601	3/3	0.97	0.05	20,22,26,27	0
4	GOL	F	604	6/6	0.97	0.06	15,23,29,29	0
5	FMT	B	601	3/3	0.97	0.07	19,19,23,25	0
2	TPP	B	602	26/26	0.98	0.05	10,15,23,28	0
2	TPP	C	601	26/26	0.98	0.04	10,14,21,25	0
2	TPP	D	602	26/26	0.98	0.05	12,17,22,25	0
5	FMT	D	601	3/3	0.98	0.07	20,21,24,25	0
2	TPP	F	602	26/26	0.98	0.05	10,16,21,25	0
2	TPP	G	601	26/26	0.98	0.04	8,15,21,23	0
2	TPP	H	602	26/26	0.98	0.05	10,16,22,22	0
2	TPP	A	601	26/26	0.98	0.05	9,15,22,30	0
3	MN	B	603	1/1	0.99	0.06	20,20,20,20	0
3	MN	D	603	1/1	0.99	0.08	22,22,22,22	0
3	MN	F	603	1/1	0.99	0.08	20,20,20,20	0
3	MN	H	603	1/1	0.99	0.08	21,21,21,21	0
2	TPP	E	601	26/26	0.99	0.04	9,14,19,27	0
3	MN	E	602	1/1	1.00	0.08	20,20,20,20	0
3	MN	C	602	1/1	1.00	0.08	20,20,20,20	0
3	MN	G	602	1/1	1.00	0.07	20,20,20,20	0
3	MN	A	602	1/1	1.00	0.06	19,19,19,19	0

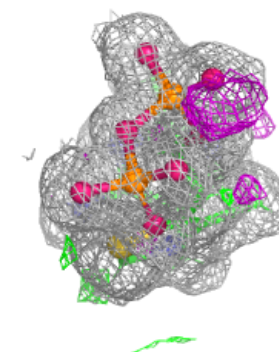
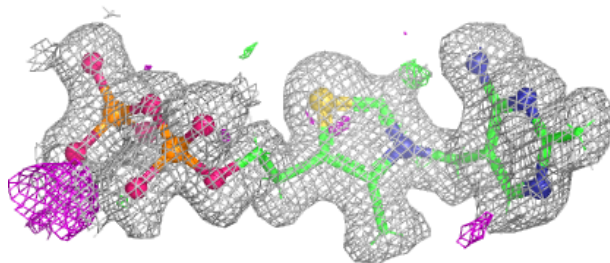
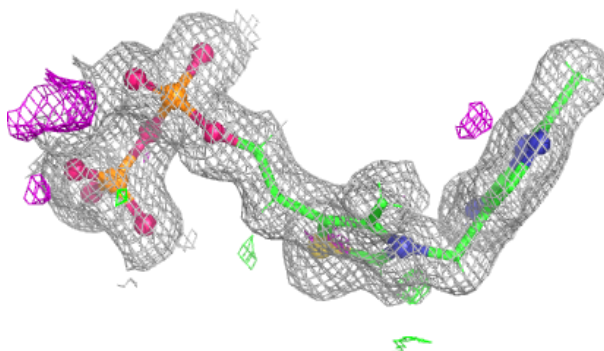
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around TPP 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)

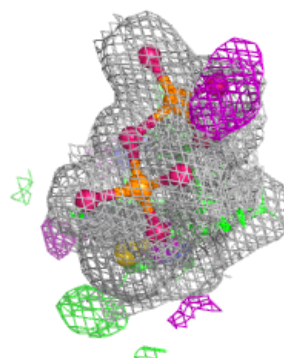
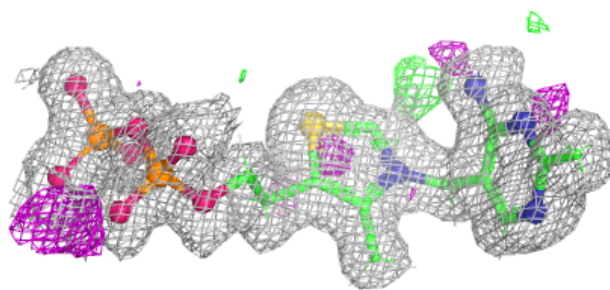
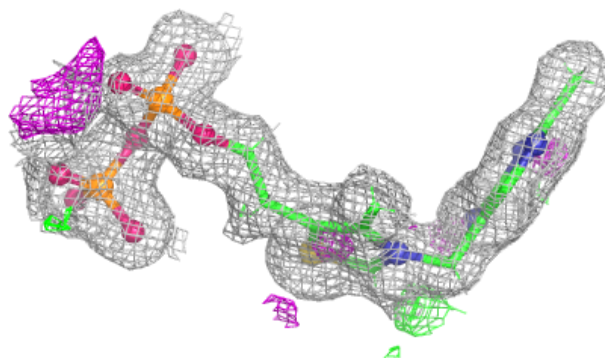
**Electron density around TPP C 601:**

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

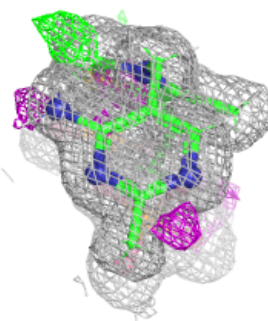
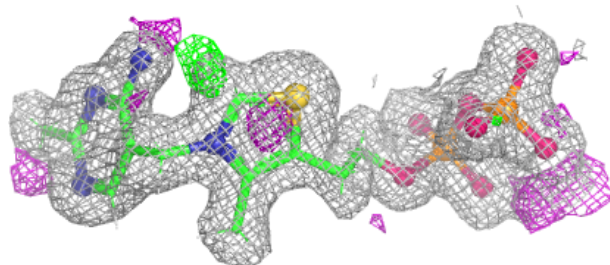
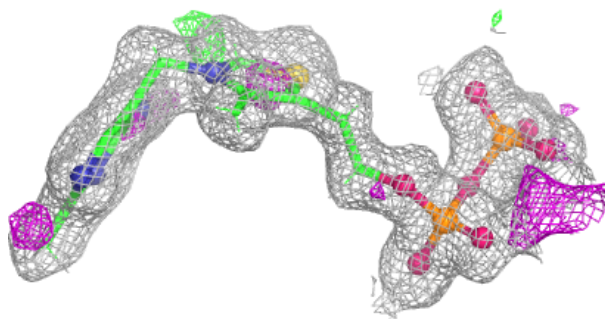


Electron density around TPP D 602:

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

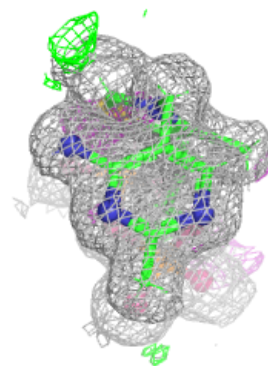
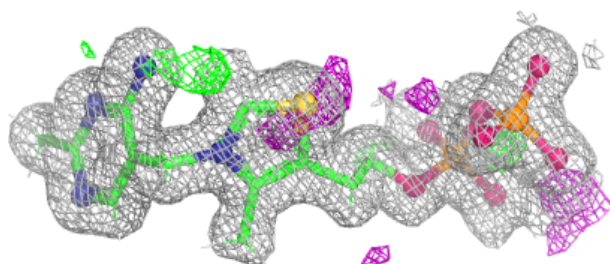
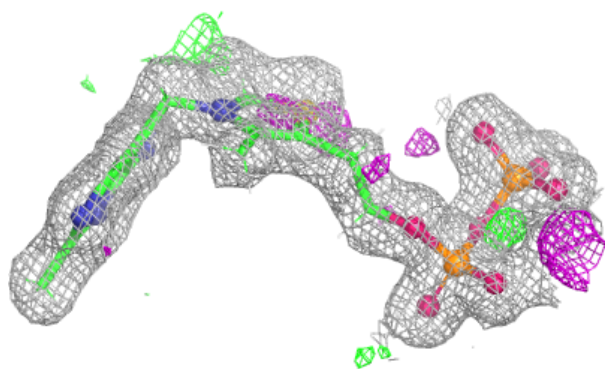
**Electron density around TPP F 602:**

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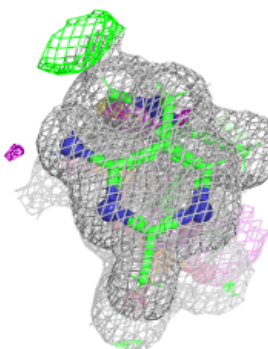
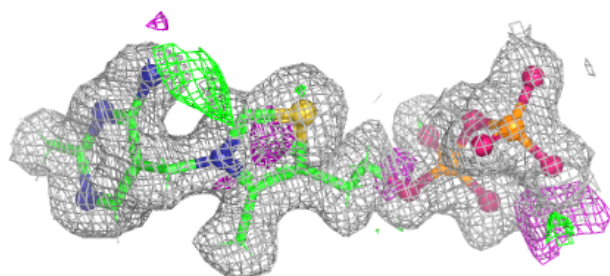
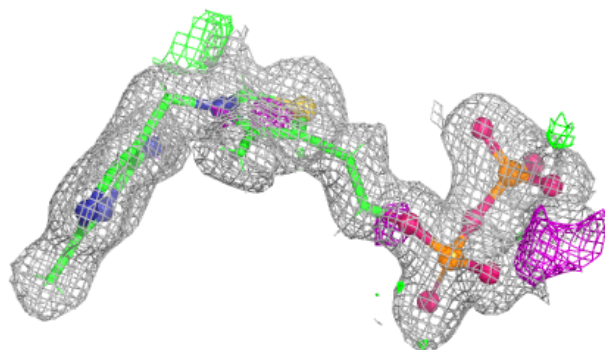


Electron density around TPP G 601:

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

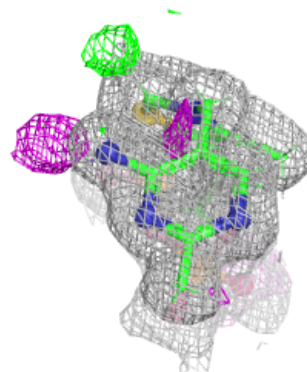
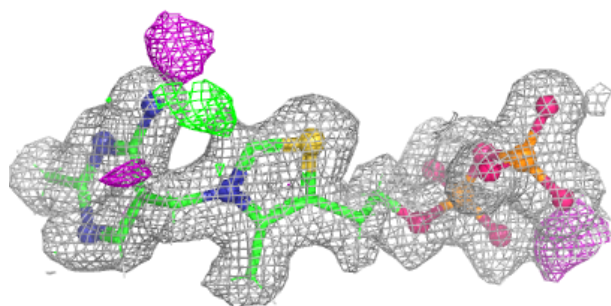
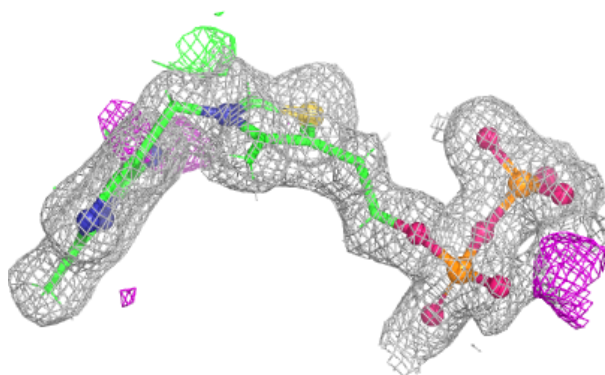
**Electron density around TPP H 602:**

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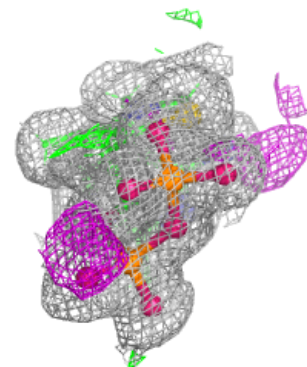
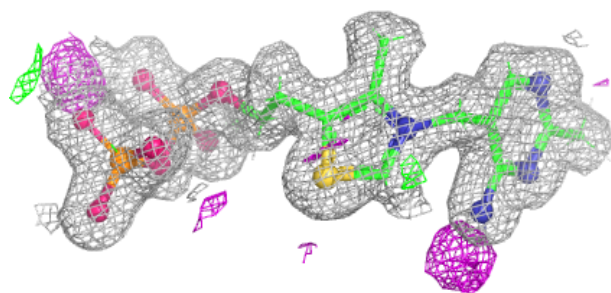
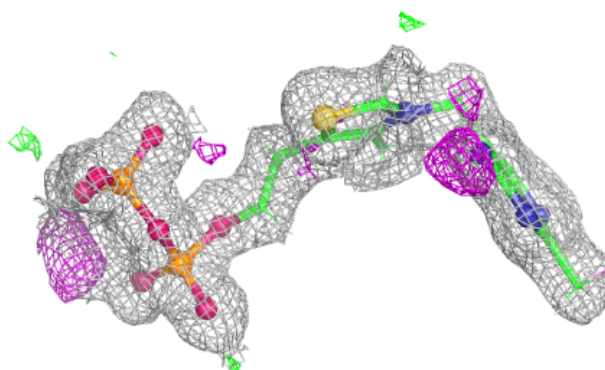


Electron density around TPP A 601:

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

**Electron density around TPP E 601:**

$2mF_o-DF_c$ (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.