



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2026 – 09:07 AM UTC

PDB ID : 4RJJ / pdb_00004rjj
Title : Acetolactate synthase from *Bacillus subtilis* bound to ThDP - crystal form II
Authors : Sommer, B.; von Moeller, H.; Haack, M.; Qoura, F.; Langner, C.; Bourenkov, G.; Garbe, D.; Brueck, T.; Loll, B.
Deposited on : 2014-10-09
Resolution : 2.34 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

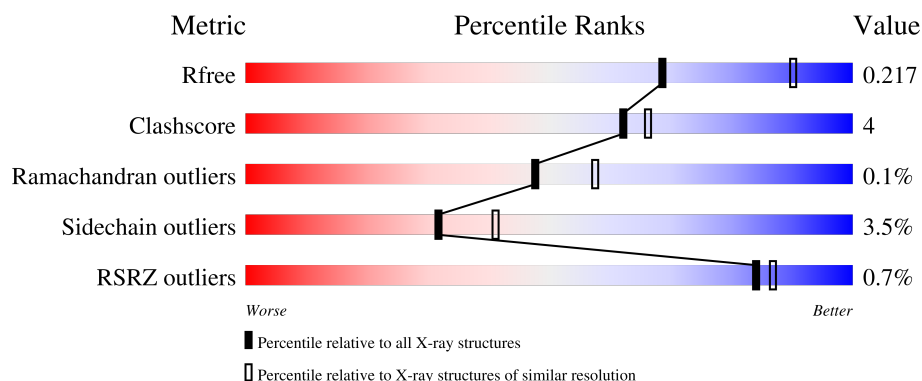
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.34 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	3031 (2.36-2.32)
Clashscore	190562	3127 (2.36-2.32)
Ramachandran outliers	187476	3095 (2.36-2.32)
Sidechain outliers	187428	3095 (2.36-2.32)
RSRZ outliers	180081	3033 (2.36-2.32)

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	571	% 86% 10% ..
1	B	571	 85% 11% ..
1	C	571	 86% 9% ..
1	D	571	% 86% 11% ..
1	E	571	% 87% 9% ..

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Mol	Chain	Length	Quality of chain
1	F	571	 85% 11% . .
1	G	571	 88% 8% . .
1	H	571	 88% 9% . .

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
4	PG4	E	603	-	-	X	-

2 Entry composition

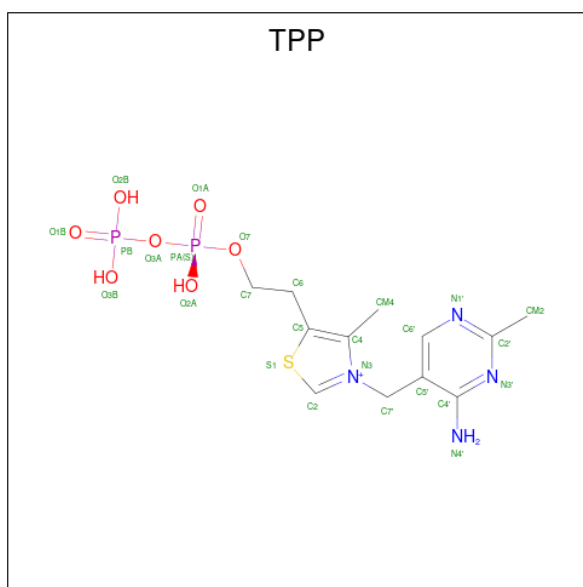
There are 6 unique types of molecules in this entry. The entry contains 36626 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Acetolactate synthase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	555	Total	C	N	O	S	0	2	0
			4261	2704	732	813	12			
1	B	553	Total	C	N	O	S	0	3	0
			4250	2697	729	812	12			
1	C	553	Total	C	N	O	S	0	5	0
			4259	2702	730	814	13			
1	D	553	Total	C	N	O	S	0	9	0
			4276	2723	729	812	12			
1	E	555	Total	C	N	O	S	0	5	0
			4281	2722	734	813	12			
1	F	553	Total	C	N	O	S	0	1	0
			4241	2692	728	809	12			
1	G	554	Total	C	N	O	S	0	1	0
			4250	2696	730	812	12			
1	H	553	Total	C	N	O	S	0	2	0
			4248	2695	729	812	12			

- Molecule 2 is THIAMINE DIPHOSPHATE (CCD ID: TPP) (formula: $C_{12}H_{19}N_4O_7P_2S$).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total 26	C 12	N 4	O 7	P 2	S 1	0	0
2	B	1	Total 26	C 12	N 4	O 7	P 2	S 1	0	0
2	C	1	Total 26	C 12	N 4	O 7	P 2	S 1	0	0
2	D	1	Total 26	C 12	N 4	O 7	P 2	S 1	0	0
2	E	1	Total 26	C 12	N 4	O 7	P 2	S 1	0	0
2	F	1	Total 26	C 12	N 4	O 7	P 2	S 1	0	0
2	G	1	Total 26	C 12	N 4	O 7	P 2	S 1	0	0
2	H	1	Total 26	C 12	N 4	O 7	P 2	S 1	0	0

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

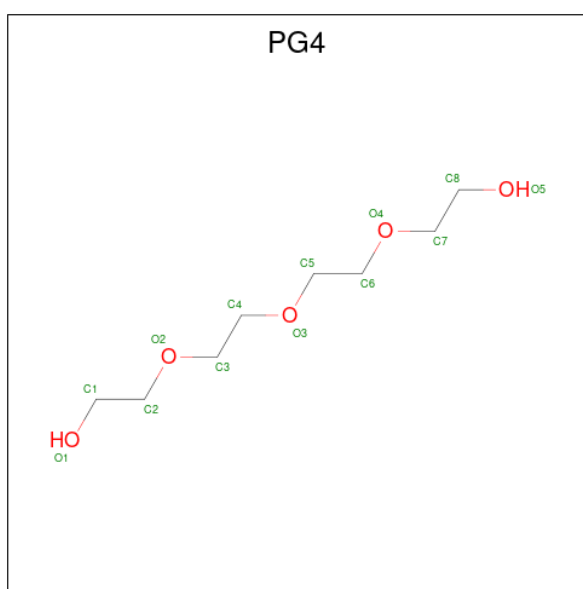
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total Mg 1 1	0	0
3	B	1	Total Mg 1 1	0	0
3	C	1	Total Mg 1 1	0	0
3	D	1	Total Mg 1 1	0	0

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

- Molecule 4 is TETRAETHYLENE GLYCOL (CCD ID: PG4) (formula: $C_8H_{18}O_5$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			10	6	4		
4	A	1	Total	C	O	0	0
			13	8	5		
4	A	1	Total	C	O	0	0
			13	8	5		
4	A	1	Total	C	O	0	0
			10	6	4		
4	B	1	Total	C	O	0	0
			10	6	4		
4	B	1	Total	C	O	0	0
			13	8	5		
4	B	1	Total	C	O	0	0
			13	8	5		

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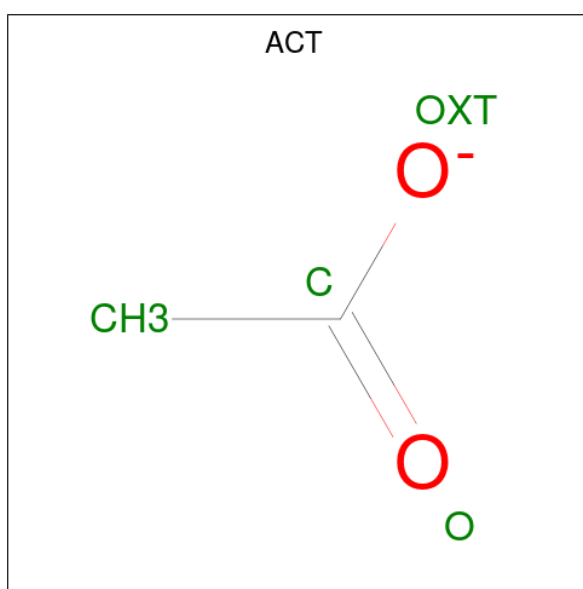
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	B	1	Total	C	O	0	0
			10	6	4		
4	C	1	Total	C	O	0	0
			13	8	5		
4	C	1	Total	C	O	0	0
			13	8	5		
4	C	1	Total	C	O	0	0
			13	8	5		
4	C	1	Total	C	O	0	0
			10	6	4		
4	D	1	Total	C	O	0	0
			13	8	5		
4	D	1	Total	C	O	0	0
			13	8	5		
4	D	1	Total	C	O	0	0
			13	8	5		
4	D	1	Total	C	O	0	0
			13	8	5		
4	D	1	Total	C	O	0	0
			10	6	4		
4	E	1	Total	C	O	0	0
			13	8	5		
4	E	1	Total	C	O	0	0
			13	8	5		
4	E	1	Total	C	O	0	0
			13	8	5		
4	E	1	Total	C	O	0	0
			13	8	5		
4	E	1	Total	C	O	0	0
			13	8	5		
4	F	1	Total	C	O	0	0
			13	8	5		
4	F	1	Total	C	O	0	0
			13	8	5		
4	F	1	Total	C	O	0	0
			10	6	4		
4	G	1	Total	C	O	0	0
			13	8	5		
4	G	1	Total	C	O	0	0
			13	8	5		
4	G	1	Total	C	O	0	0
			11	7	4		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	G	1	Total	C	O	0	0
			8	5	3		
4	H	1	Total	C	O	0	0
			13	8	5		
4	H	1	Total	C	O	0	0
			10	6	4		
4	H	1	Total	C	O	0	0
			13	8	5		

- Molecule 5 is ACETATE ION (CCD ID: ACT) (formula: $C_2H_3O_2$).



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

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	215	Total	O	0	0
			215	215		
6	B	259	Total	O	0	2
			259	259		
6	C	277	Total	O	0	2
			277	277		
6	D	245	Total	O	0	0
			245	245		

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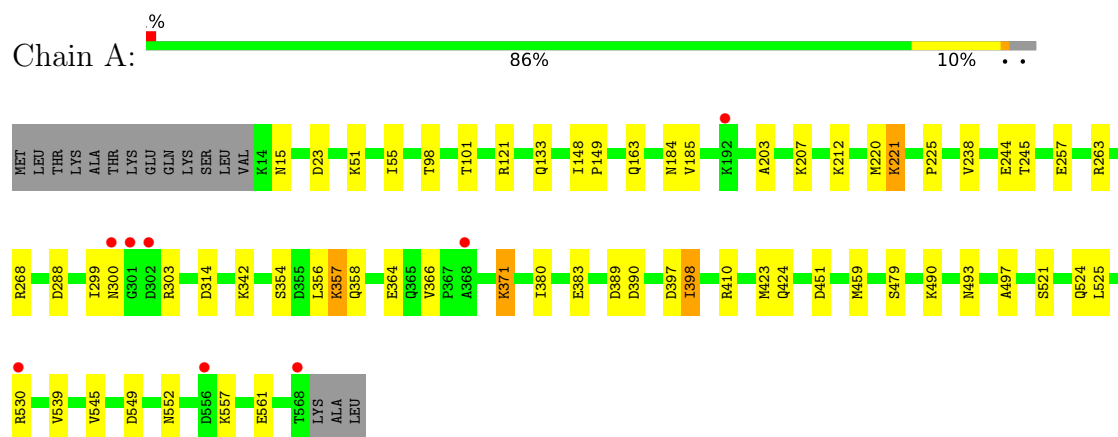
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	E	260	Total 260	O 260	0	1
6	F	264	Total 264	O 264	0	0
6	G	232	Total 232	O 232	0	0
6	H	203	Total 203	O 203	0	2

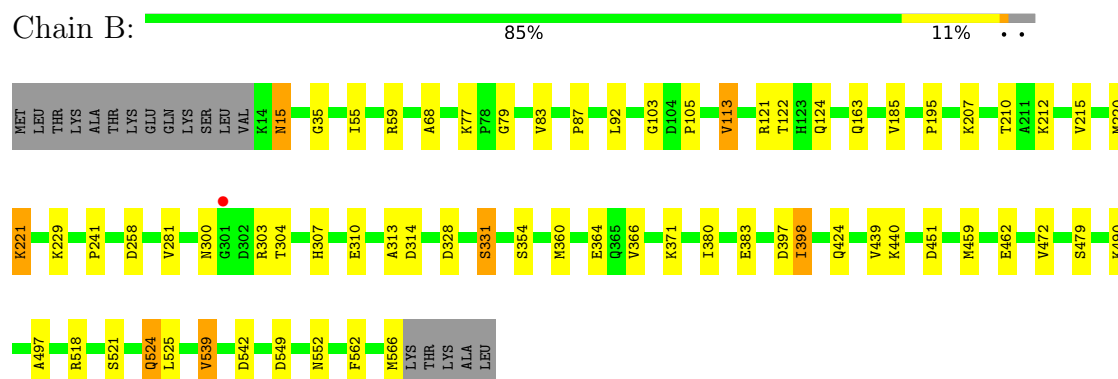
3 Residue-property plots

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.

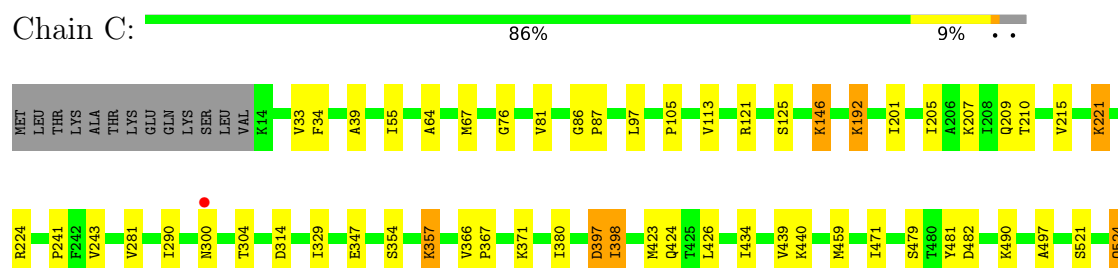
• Molecule 1: Acetolactate synthase



• Molecule 1: Acetolactate synthase

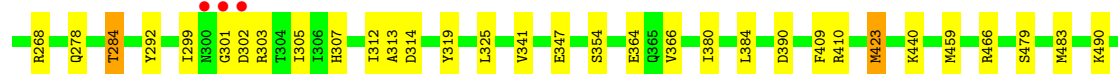
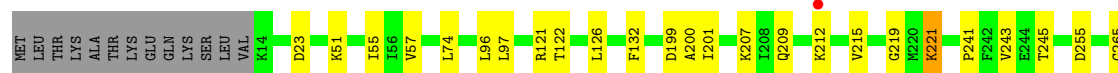
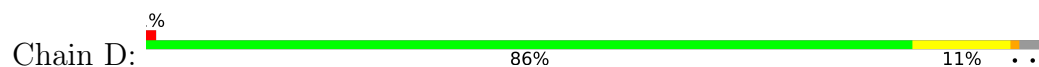


• Molecule 1: Acetolactate synthase

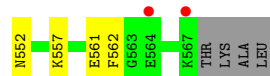
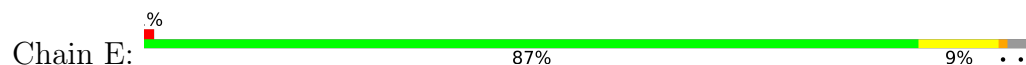




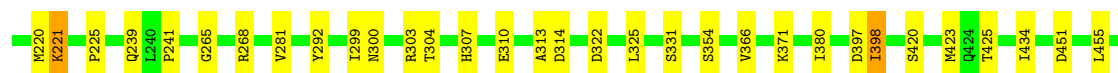
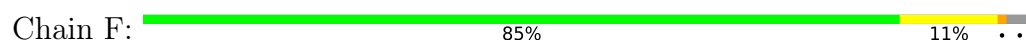
• Molecule 1: Acetolactate synthase



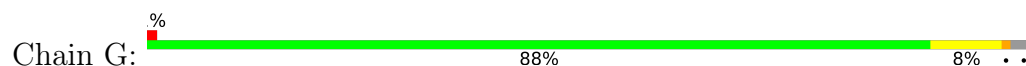
• Molecule 1: Acetolactate synthase

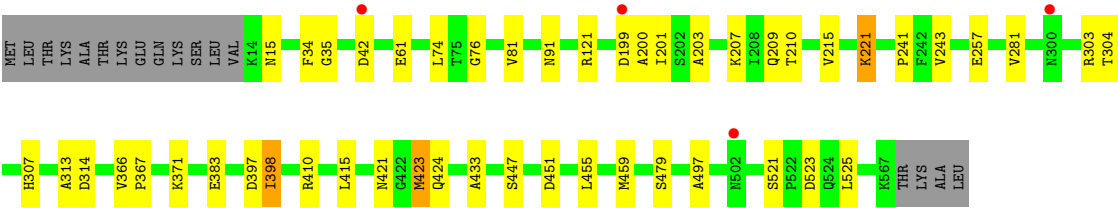


• Molecule 1: Acetolactate synthase

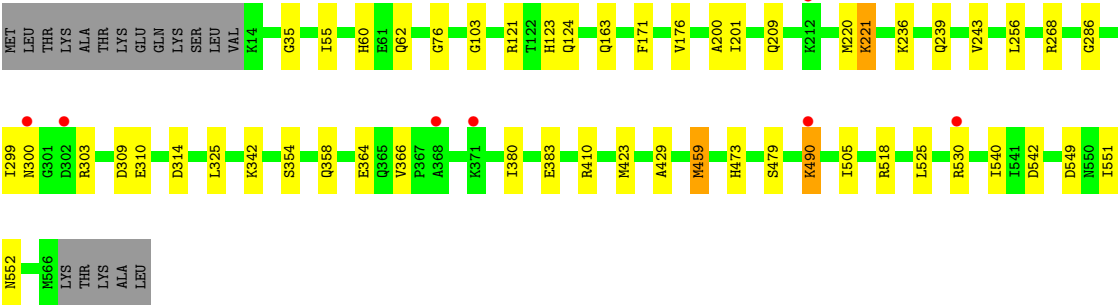
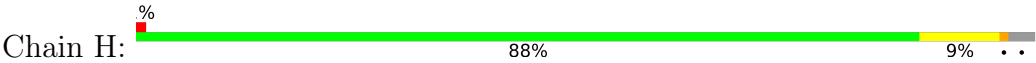


• Molecule 1: Acetolactate synthase





● Molecule 1: Acetolactate synthase



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 2 21	Depositor
Cell constants a, b, c, α , β , γ	111.67Å 170.00Å 339.81Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 2.34 30.00 – 2.34	Depositor EDS
% Data completeness (in resolution range)	98.4 (30.00-2.34) 98.5 (30.00-2.34)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.76 (at 2.34Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8_1069)	Depositor
R, R_{free}	0.172 , 0.216 0.172 , 0.217	Depositor DCC
R_{free} test set	13402 reflections (4.92%)	wwPDB-VP
Wilson B-factor (Å ²)	27.5	Xtriage
Anisotropy	0.057	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 45.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.27$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	36626	wwPDB-VP
Average B, all atoms (Å ²)	24.0	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 25.76 % 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 2.9849e-03. 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: PG4, ACT, TPP, MG

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

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# $ Z > 5$	RMSZ	# $ Z > 5$
1	A	0.54	1/4348 (0.0%)	0.85	1/5912 (0.0%)
1	B	0.53	0/4340	0.84	1/5902 (0.0%)
1	C	0.55	1/4354 (0.0%)	0.85	1/5920 (0.0%)
1	D	0.54	0/4385	0.85	3/5965 (0.1%)
1	E	0.54	0/4377	0.84	0/5951
1	F	0.54	0/4325	0.85	2/5881 (0.0%)
1	G	0.52	0/4334	0.86	1/5892 (0.0%)
1	H	0.53	0/4335	0.85	1/5894 (0.0%)
All	All	0.54	2/34798 (0.0%)	0.85	10/47317 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	329	ILE	CA-CB	5.41	1.57	1.54
1	A	148	ILE	CA-CB	5.09	1.56	1.54

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	H	35	GLY	N-CA-C	6.34	119.87	110.42
1	D	550	ASN	N-CA-C	5.89	117.70	111.28
1	F	52	GLY	CA-C-N	5.57	125.52	119.78
1	F	52	GLY	C-N-CA	5.57	125.52	119.78
1	B	35	GLY	N-CA-C	5.21	119.10	110.55

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	4261	0	4280	51	0
1	B	4250	0	4264	40	0
1	C	4259	0	4273	36	0
1	D	4276	0	4318	37	0
1	E	4281	0	4319	44	0
1	F	4241	0	4256	47	0
1	G	4250	0	4262	25	0
1	H	4248	0	4259	31	0
2	A	26	0	16	0	0
2	B	26	0	16	1	0
2	C	26	0	16	2	0
2	D	26	0	16	2	0
2	E	26	0	16	0	0
2	F	26	0	16	0	0
2	G	26	0	16	0	0
2	H	26	0	16	0	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	46	0	62	6	0
4	B	46	0	62	6	0
4	C	49	0	67	9	0
4	D	62	0	85	7	0
4	E	65	0	90	15	0
4	F	36	0	49	5	0
4	G	45	0	58	2	0
4	H	36	0	49	2	0
5	D	4	0	3	0	0
6	A	215	0	0	3	0
6	B	259	0	0	0	0
6	C	277	0	0	2	0
6	D	245	0	0	4	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	E	260	0	0	3	0
6	F	264	0	0	2	0
6	G	232	0	0	1	0
6	H	203	0	0	2	0
All	All	36626	0	34884	284	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 4.

The worst 5 of 284 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:207:LYS:HZ1	4:B:605:PG4:H42	1.36	0.89
1:A:101:THR:HG22	4:A:605:PG4:H82	1.61	0.83
1:D:390:ASP:H	4:D:603:PG4:H12	1.44	0.83
1:E:390:ASP:H	4:E:603:PG4:H71	1.44	0.82
1:F:398:ILE:HD11	1:F:420:SER:HB3	1.61	0.82

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	555/571 (97%)	544 (98%)	11 (2%)	0	100	100
1	B	554/571 (97%)	540 (98%)	13 (2%)	1 (0%)	43	50
1	C	556/571 (97%)	544 (98%)	11 (2%)	1 (0%)	43	50
1	D	560/571 (98%)	549 (98%)	10 (2%)	1 (0%)	43	50
1	E	558/571 (98%)	546 (98%)	11 (2%)	1 (0%)	43	50
1	F	552/571 (97%)	538 (98%)	13 (2%)	1 (0%)	43	50

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	G	553/571 (97%)	544 (98%)	9 (2%)	0	100	100
1	H	553/571 (97%)	542 (98%)	10 (2%)	1 (0%)	43	50
All	All	4441/4568 (97%)	4347 (98%)	88 (2%)	6 (0%)	48	57

5 of 6 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	302	ASP
1	E	300	ASN
1	B	300	ASN
1	H	300	ASN
1	C	300	ASN

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	456/468 (97%)	440 (96%)	16 (4%)	32	41
1	B	455/468 (97%)	435 (96%)	20 (4%)	25	33
1	C	457/468 (98%)	438 (96%)	19 (4%)	26	34
1	D	461/468 (98%)	439 (95%)	22 (5%)	23	29
1	E	459/468 (98%)	444 (97%)	15 (3%)	33	43
1	F	453/468 (97%)	436 (96%)	17 (4%)	29	38
1	G	454/468 (97%)	441 (97%)	13 (3%)	37	48
1	H	454/468 (97%)	442 (97%)	12 (3%)	40	53
All	All	3649/3744 (98%)	3515 (96%)	134 (4%)	32	39

5 of 134 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	G	371	LYS
1	G	451	ASP

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Mol	Chain	Res	Type
1	H	459	MET
1	C	398	ILE
1	C	397	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 38 such sidechains are listed below:

Mol	Chain	Res	Type
1	G	487	GLN
1	H	320	GLN
1	H	32	HIS
1	H	147	ASN
1	H	487	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 49 ligands modelled in this entry, 8 are monoatomic - leaving 41 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	$\# Z > 2$
4	PG4	A	604	-	12,12,12	0.57	0	11,11,11	0.95	1 (9%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	TPP	C	601	3	26,27,27	1.82	10 (38%)	38,40,40	1.75	8 (21%)
2	TPP	F	601	3	26,27,27	1.85	8 (30%)	38,40,40	1.51	7 (18%)
4	PG4	C	603	-	12,12,12	0.56	0	11,11,11	0.86	0
4	PG4	C	604	-	12,12,12	0.56	0	11,11,11	0.87	0
4	PG4	H	604	-	9,9,12	0.58	0	8,8,11	0.95	1 (12%)
4	PG4	E	607	-	12,12,12	0.62	0	11,11,11	0.85	0
4	PG4	A	603	-	9,9,12	0.64	0	8,8,11	0.80	0
4	PG4	H	603	-	12,12,12	0.47	0	11,11,11	1.03	1 (9%)
4	PG4	D	607	-	9,9,12	0.63	0	8,8,11	0.80	0
2	TPP	G	601	3	26,27,27	1.78	8 (30%)	38,40,40	1.45	7 (18%)
4	PG4	D	604	-	12,12,12	0.57	0	11,11,11	0.83	0
4	PG4	B	603	-	9,9,12	0.71	0	8,8,11	0.94	0
4	PG4	B	604	-	12,12,12	0.59	0	11,11,11	0.95	0
4	PG4	E	603	-	12,12,12	0.70	0	11,11,11	0.98	0
2	TPP	A	601	3	26,27,27	1.78	10 (38%)	38,40,40	1.45	7 (18%)
4	PG4	E	604	-	12,12,12	0.57	0	11,11,11	0.95	0
4	PG4	G	605	-	10,10,12	0.50	0	9,9,11	0.86	0
4	PG4	D	605	-	12,12,12	0.62	0	11,11,11	0.85	0
4	PG4	B	605	-	12,12,12	0.60	0	11,11,11	1.02	0
4	PG4	G	603	-	12,12,12	0.60	0	11,11,11	0.99	0
4	PG4	D	603	-	12,12,12	0.66	0	11,11,11	0.82	0
4	PG4	G	604	-	12,12,12	0.56	0	11,11,11	0.91	0
4	PG4	C	605	-	12,12,12	0.64	0	11,11,11	0.68	0
4	PG4	E	606	-	12,12,12	0.54	0	11,11,11	1.22	2 (18%)
4	PG4	G	606	-	7,7,12	0.52	0	6,6,11	0.92	0
4	PG4	F	603	-	12,12,12	0.63	0	11,11,11	0.94	0
4	PG4	A	605	-	12,12,12	0.49	0	11,11,11	1.01	1 (9%)
4	PG4	D	606	-	12,12,12	0.59	0	11,11,11	0.88	0
2	TPP	E	601	3	26,27,27	1.83	10 (38%)	38,40,40	1.69	7 (18%)
4	PG4	B	606	-	9,9,12	0.49	0	8,8,11	1.03	1 (12%)
4	PG4	F	604	-	12,12,12	0.65	0	11,11,11	0.91	1 (9%)
2	TPP	H	601	3	26,27,27	1.82	9 (34%)	38,40,40	1.49	7 (18%)
4	PG4	H	605	-	12,12,12	0.58	0	11,11,11	1.00	1 (9%)
4	PG4	F	605	-	9,9,12	0.61	0	8,8,11	0.79	0
2	TPP	B	601	3	26,27,27	1.70	8 (30%)	38,40,40	1.50	7 (18%)
5	ACT	D	608	-	3,3,3	0.86	0	3,3,3	1.28	0
4	PG4	E	605	-	12,12,12	0.61	0	11,11,11	0.84	0
2	TPP	D	601	3	26,27,27	1.77	9 (34%)	38,40,40	1.65	7 (18%)
4	PG4	A	606	-	9,9,12	0.64	0	8,8,11	0.95	1 (12%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	PG4	C	606	-	9,9,12	0.48	0	8,8,11	0.95	1 (12%)

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
4	PG4	A	604	-	-	7/10/10/10	-
2	TPP	C	601	3	-	0/17/17/17	0/2/2/2
2	TPP	F	601	3	-	1/17/17/17	0/2/2/2
4	PG4	C	603	-	-	1/10/10/10	-
4	PG4	C	604	-	-	3/10/10/10	-
4	PG4	H	604	-	-	2/7/7/10	-
4	PG4	E	607	-	-	6/10/10/10	-
4	PG4	A	603	-	-	1/7/7/10	-
4	PG4	H	603	-	-	5/10/10/10	-
4	PG4	D	607	-	-	4/7/7/10	-
2	TPP	G	601	3	-	1/17/17/17	0/2/2/2
4	PG4	D	604	-	-	3/10/10/10	-
4	PG4	B	603	-	-	5/7/7/10	-
4	PG4	B	604	-	-	6/10/10/10	-
4	PG4	E	603	-	-	7/10/10/10	-
2	TPP	A	601	3	-	1/17/17/17	0/2/2/2
4	PG4	E	604	-	-	5/10/10/10	-
4	PG4	G	605	-	-	5/8/8/10	-
4	PG4	D	605	-	-	6/10/10/10	-
4	PG4	B	605	-	-	6/10/10/10	-
4	PG4	G	603	-	-	6/10/10/10	-
4	PG4	D	603	-	-	6/10/10/10	-
4	PG4	G	604	-	-	1/10/10/10	-
4	PG4	C	605	-	-	4/10/10/10	-
4	PG4	E	606	-	-	6/10/10/10	-
4	PG4	G	606	-	-	2/5/5/10	-
4	PG4	F	603	-	-	7/10/10/10	-
4	PG4	A	605	-	-	5/10/10/10	-
4	PG4	D	606	-	-	7/10/10/10	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	TPP	E	601	3	-	0/17/17/17	0/2/2/2
4	PG4	B	606	-	-	4/7/7/10	-
4	PG4	F	604	-	-	2/10/10/10	-
2	TPP	H	601	3	-	1/17/17/17	0/2/2/2
4	PG4	H	605	-	-	8/10/10/10	-
4	PG4	F	605	-	-	5/7/7/10	-
2	TPP	B	601	3	-	0/17/17/17	0/2/2/2
4	PG4	E	605	-	-	5/10/10/10	-
2	TPP	D	601	3	-	1/17/17/17	0/2/2/2
4	PG4	A	606	-	-	1/7/7/10	-
4	PG4	C	606	-	-	5/7/7/10	-

The worst 5 of 72 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	H	601	TPP	C4'-N4'	4.53	1.45	1.34
2	F	601	TPP	C4'-N4'	4.51	1.45	1.34
2	G	601	TPP	C4'-N4'	4.49	1.45	1.34
2	C	601	TPP	C4'-N4'	4.49	1.45	1.34
2	A	601	TPP	C4'-N4'	4.36	1.45	1.34

The worst 5 of 68 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	601	TPP	CM2-C2'-N1'	5.67	123.23	117.20
2	C	601	TPP	CM2-C2'-N1'	5.54	123.09	117.20
2	D	601	TPP	CM2-C2'-N1'	4.79	122.30	117.20
2	C	601	TPP	N1'-C2'-N3'	-4.36	118.28	125.53
2	D	601	TPP	N1'-C2'-N3'	-3.87	119.09	125.53

There are no chirality outliers.

5 of 151 torsion outliers are listed below:

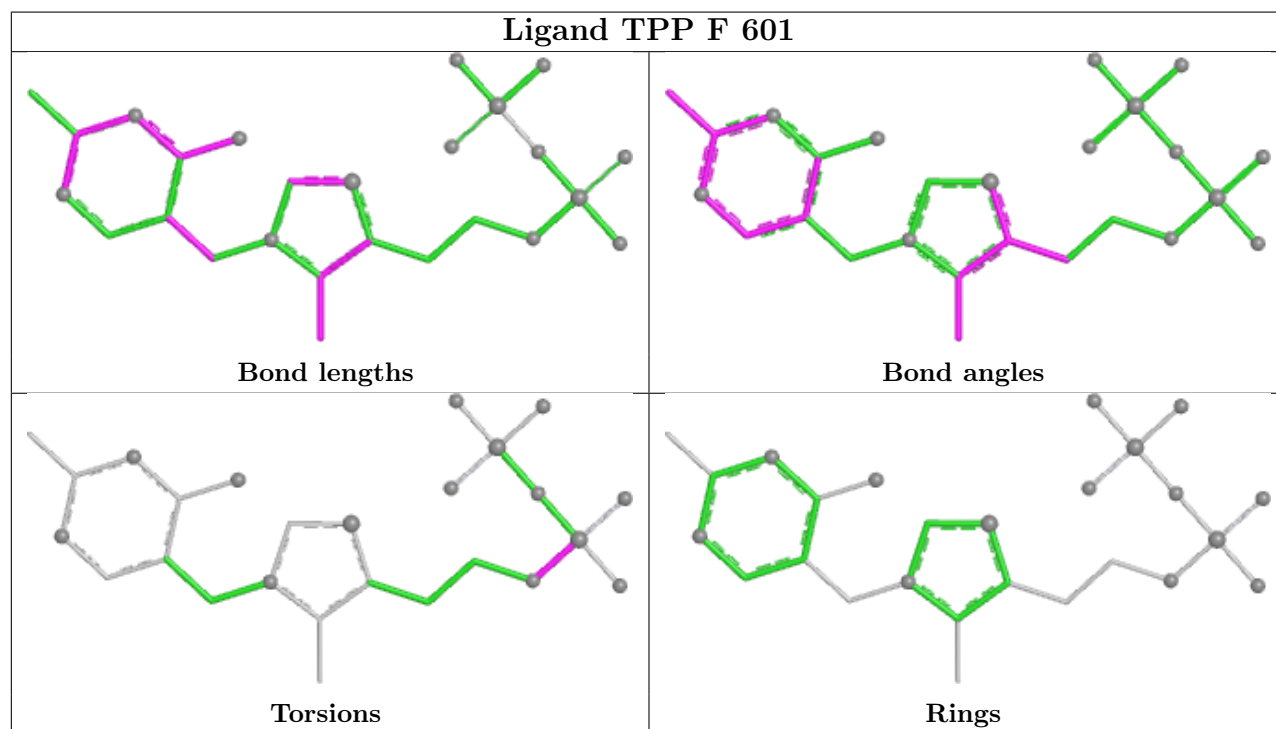
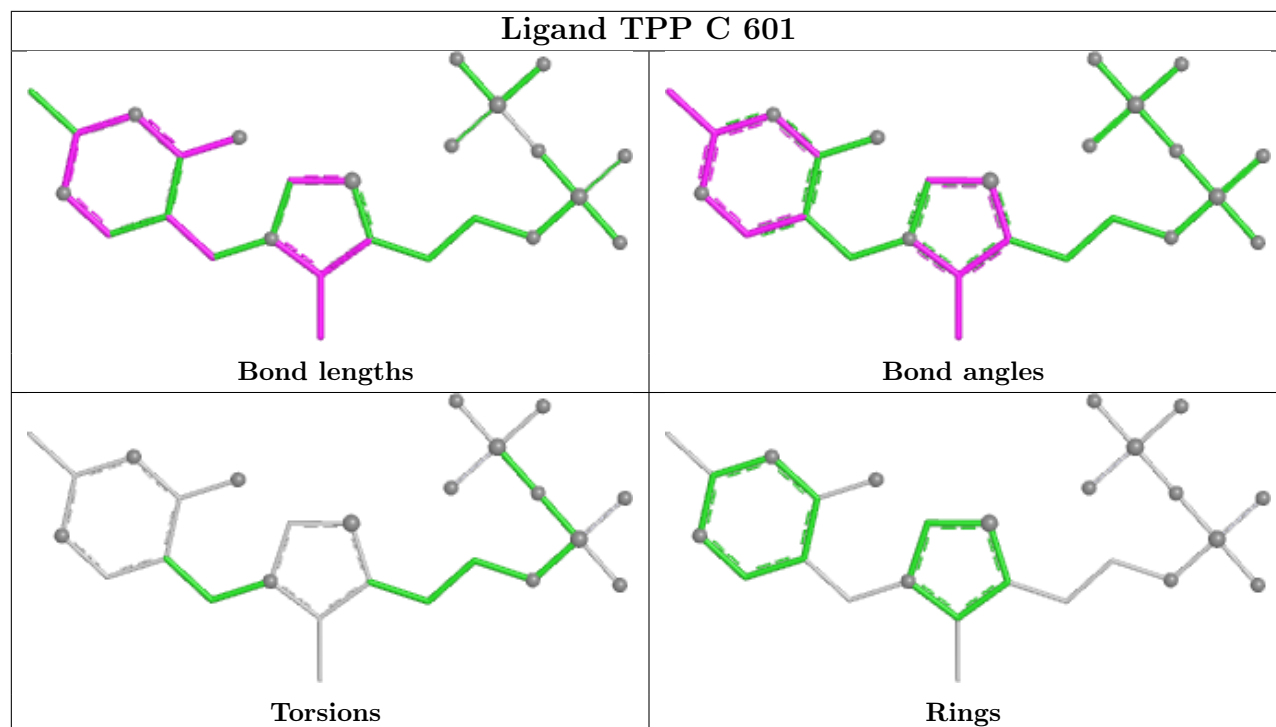
Mol	Chain	Res	Type	Atoms
2	H	601	TPP	PB-O3A-PA-O7
4	B	603	PG4	C6-C5-O3-C4
4	A	605	PG4	C1-C2-O2-C3
4	G	603	PG4	C3-C4-O3-C5
4	F	603	PG4	C5-C6-O4-C7

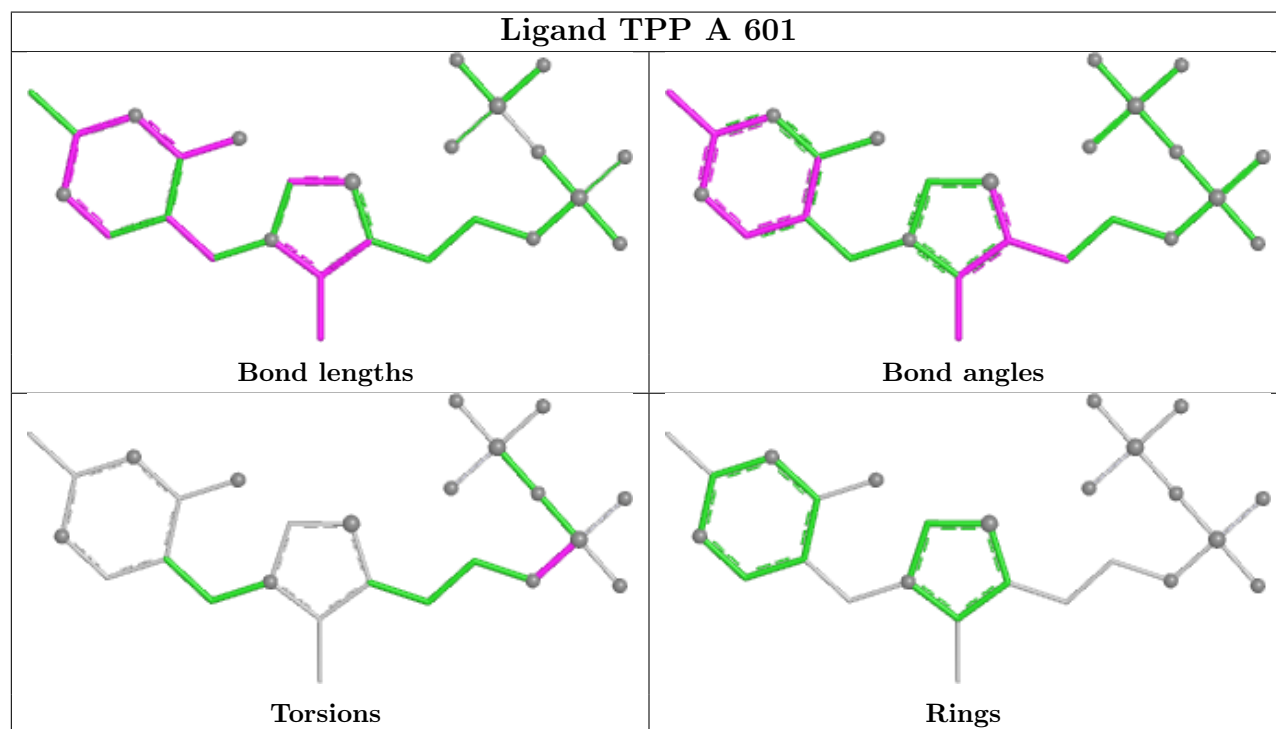
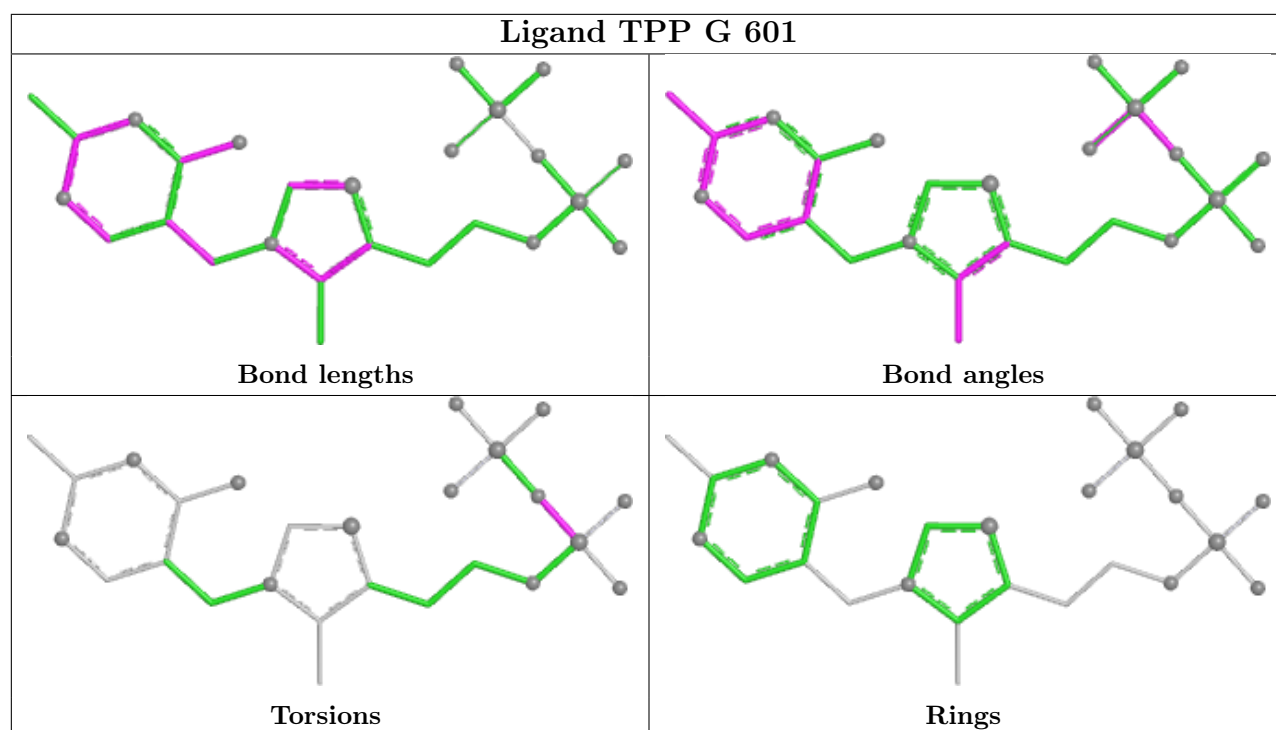
There are no ring outliers.

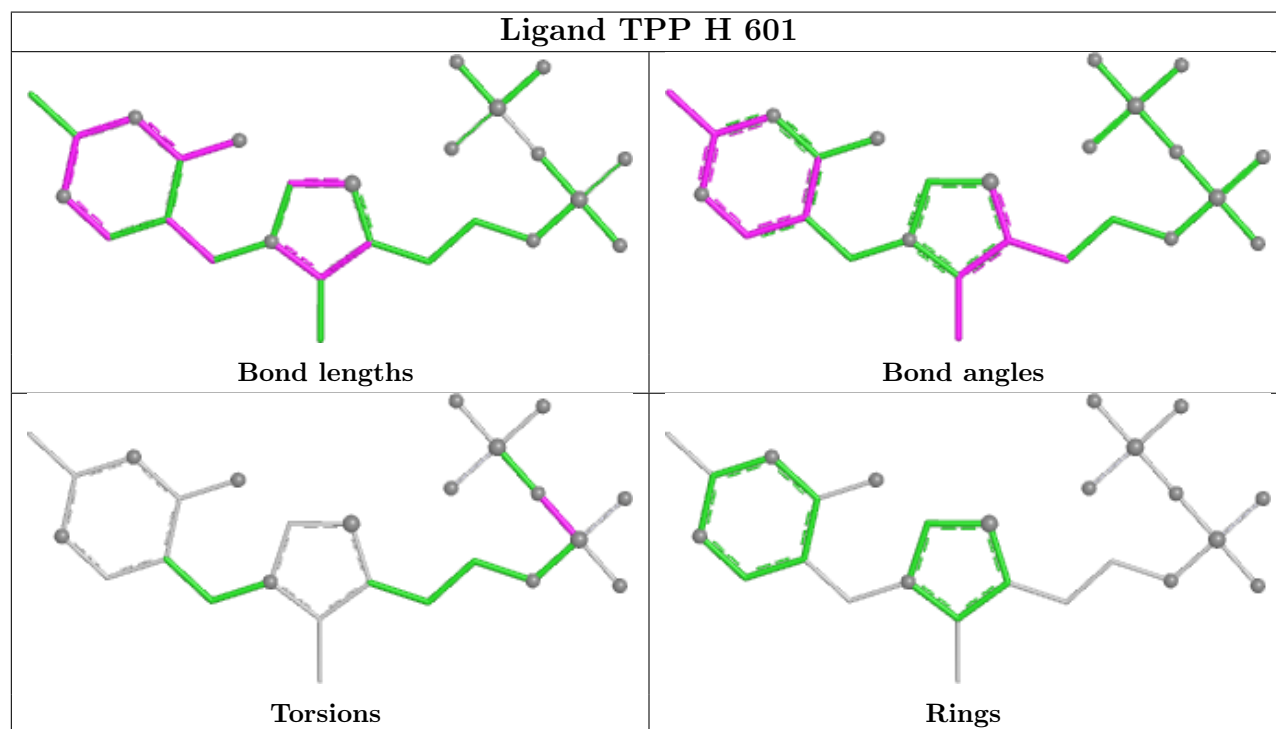
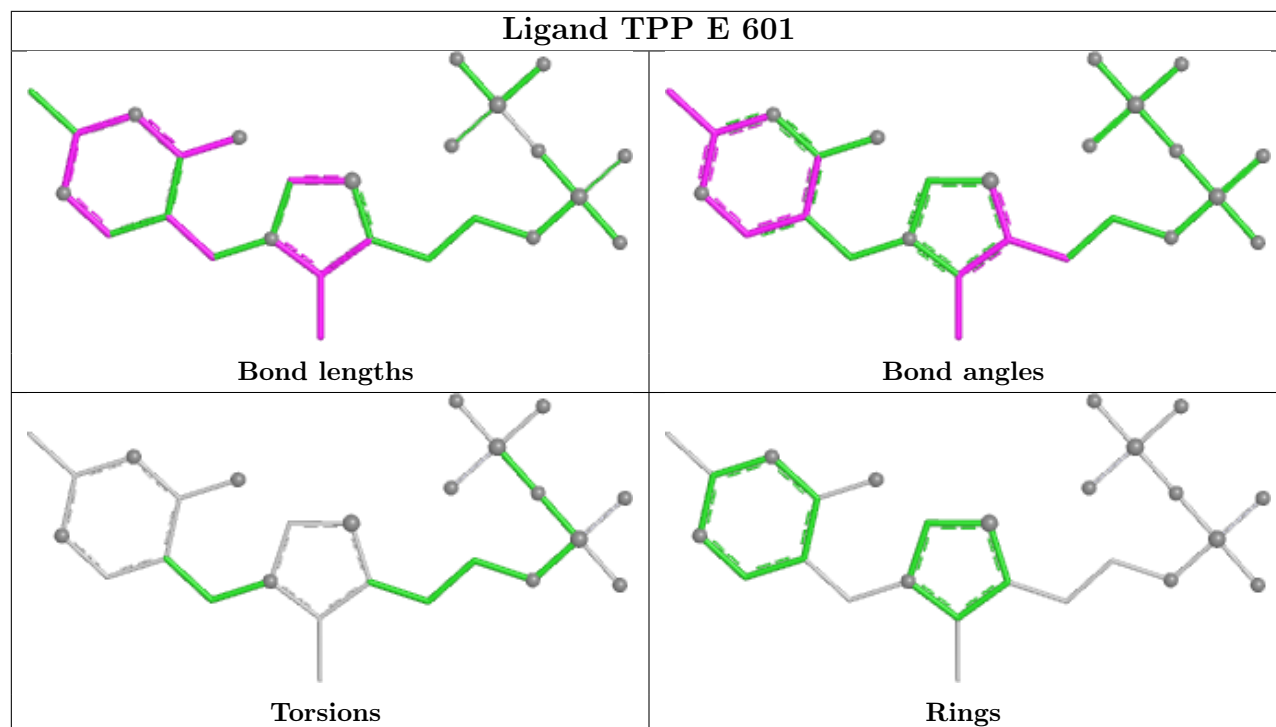
25 monomers are involved in 56 short contacts:

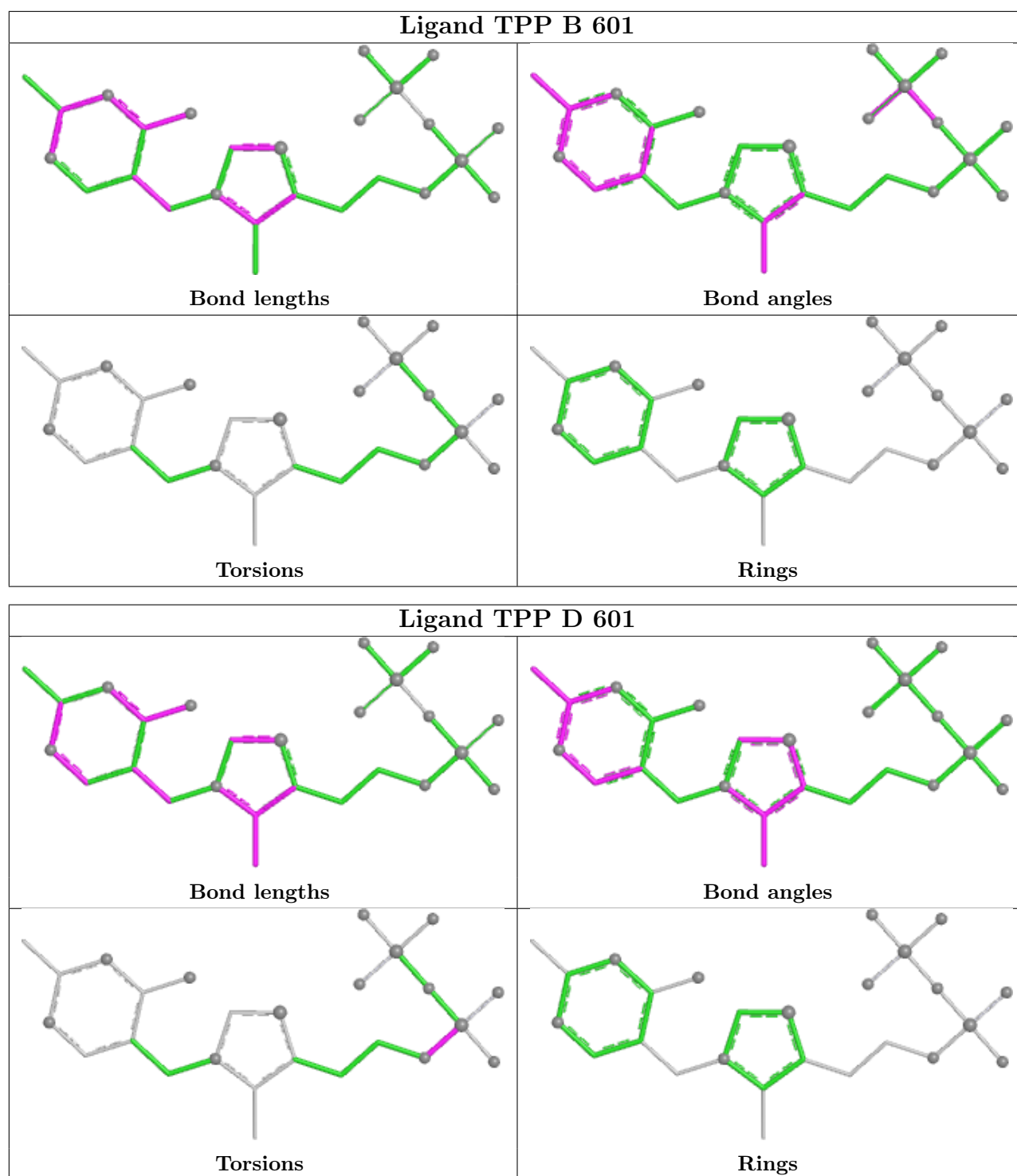
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	604	PG4	4	0
2	C	601	TPP	2	0
4	C	603	PG4	1	0
4	C	604	PG4	2	0
4	E	607	PG4	2	0
4	A	603	PG4	1	0
4	D	607	PG4	2	0
4	D	604	PG4	1	0
4	B	603	PG4	2	0
4	E	603	PG4	7	0
4	D	605	PG4	2	0
4	B	605	PG4	3	0
4	G	603	PG4	2	0
4	D	603	PG4	1	0
4	C	605	PG4	4	0
4	E	606	PG4	6	0
4	F	603	PG4	4	0
4	A	605	PG4	1	0
4	D	606	PG4	1	0
4	B	606	PG4	1	0
4	F	604	PG4	1	0
4	H	605	PG4	2	0
2	B	601	TPP	1	0
2	D	601	TPP	2	0
4	C	606	PG4	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 ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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	555/571 (97%)	-0.34	8 (1%) 73 77	11, 23, 45, 79	2 (0%)
1	B	553/571 (96%)	-0.52	1 (0%) 91 92	9, 20, 44, 72	3 (0%)
1	C	553/571 (96%)	-0.56	1 (0%) 91 92	7, 19, 40, 71	5 (0%)
1	D	553/571 (96%)	-0.47	4 (0%) 84 87	8, 20, 43, 70	9 (1%)
1	E	555/571 (97%)	-0.49	6 (1%) 78 81	8, 19, 42, 71	5 (0%)
1	F	553/571 (96%)	-0.52	2 (0%) 88 90	9, 20, 42, 68	1 (0%)
1	G	554/571 (97%)	-0.49	4 (0%) 84 87	11, 21, 43, 76	1 (0%)
1	H	553/571 (96%)	-0.32	7 (1%) 75 79	13, 24, 47, 71	2 (0%)
All	All	4429/4568 (96%)	-0.46	33 (0%) 84 87	7, 21, 44, 79	28 (0%)

The worst 5 of 33 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	300	ASN	5.5
1	A	568	THR	4.4
1	D	302	ASP	3.4
1	E	302	ASP	3.1
1	D	301	GLY	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
4	PG4	H	603	13/13	0.74	0.18	28,40,48,50	0
4	PG4	A	605	13/13	0.77	0.15	28,37,48,48	0
4	PG4	E	604	13/13	0.78	0.15	37,49,60,74	0
4	PG4	B	606	10/13	0.79	0.15	33,45,50,58	0
4	PG4	G	606	8/13	0.79	0.17	41,46,52,53	0
4	PG4	C	606	10/13	0.79	0.15	36,48,52,55	0
5	ACT	D	608	4/4	0.79	0.14	30,32,34,37	0
4	PG4	G	605	11/13	0.80	0.15	31,39,47,52	0
4	PG4	E	606	13/13	0.83	0.14	18,31,41,42	0
4	PG4	E	605	13/13	0.84	0.13	33,46,53,58	0
4	PG4	E	607	13/13	0.84	0.13	37,47,58,59	0
4	PG4	C	604	13/13	0.85	0.12	32,37,47,49	0
4	PG4	H	605	13/13	0.85	0.12	26,37,46,50	0
4	PG4	F	605	10/13	0.85	0.14	34,40,43,48	0
4	PG4	H	604	10/13	0.86	0.12	36,42,48,52	0
4	PG4	B	604	13/13	0.86	0.12	37,42,51,59	0
4	PG4	D	607	10/13	0.86	0.10	31,39,47,49	0
4	PG4	D	603	13/13	0.87	0.13	20,27,37,42	0
4	PG4	E	603	13/13	0.89	0.11	24,30,36,40	0
4	PG4	B	605	13/13	0.89	0.10	24,29,39,44	0
4	PG4	G	603	13/13	0.89	0.12	17,31,49,49	0
4	PG4	F	603	13/13	0.90	0.10	25,31,38,40	0
4	PG4	B	603	10/13	0.91	0.11	13,24,31,42	0
4	PG4	F	604	13/13	0.91	0.10	19,29,41,42	0
4	PG4	D	604	13/13	0.91	0.09	23,32,42,46	0
4	PG4	A	604	13/13	0.91	0.10	27,35,47,47	0
4	PG4	A	606	10/13	0.91	0.10	36,41,45,47	0
4	PG4	C	605	13/13	0.92	0.10	16,28,41,41	0
4	PG4	G	604	13/13	0.92	0.08	22,29,41,41	0
4	PG4	D	605	13/13	0.92	0.10	22,30,49,52	0
4	PG4	D	606	13/13	0.92	0.10	26,33,38,43	0
3	MG	H	602	1/1	0.94	0.11	36,36,36,36	0
4	PG4	C	603	13/13	0.95	0.07	21,27,34,36	0
4	PG4	A	603	10/13	0.95	0.12	21,29,38,40	0
2	TPP	F	601	26/26	0.95	0.08	17,27,33,34	0
2	TPP	H	601	26/26	0.95	0.08	17,28,36,39	0
2	TPP	A	601	26/26	0.95	0.09	19,30,38,38	0

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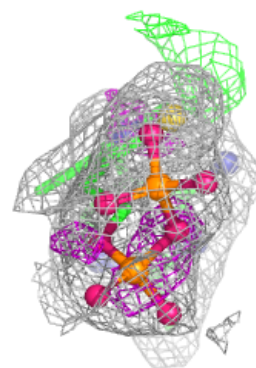
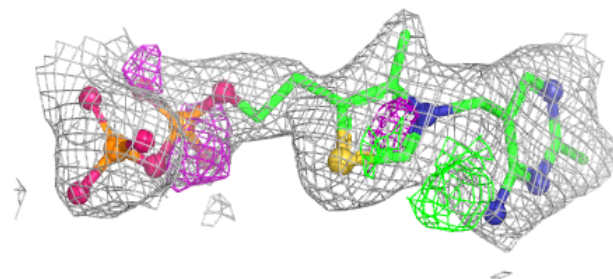
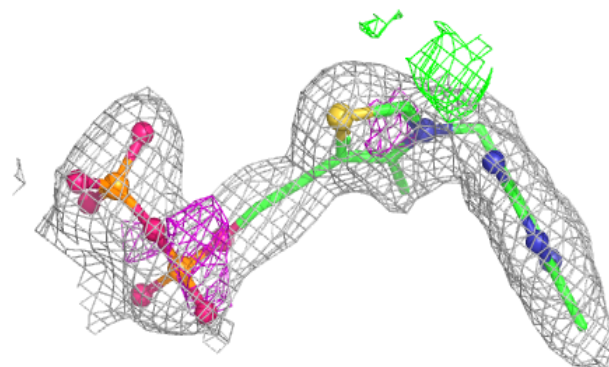
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	TPP	G	601	26/26	0.96	0.08	17,25,32,35	0
2	TPP	E	601	26/26	0.96	0.08	15,24,35,35	0
2	TPP	D	601	26/26	0.96	0.08	15,27,35,41	0
2	TPP	C	601	26/26	0.97	0.07	13,27,33,34	0
2	TPP	B	601	26/26	0.97	0.07	17,29,33,36	0
3	MG	E	602	1/1	0.98	0.05	30,30,30,30	0
3	MG	F	602	1/1	0.98	0.09	24,24,24,24	0
3	MG	B	602	1/1	0.98	0.06	29,29,29,29	0
3	MG	C	602	1/1	0.98	0.03	28,28,28,28	0
3	MG	D	602	1/1	0.99	0.06	25,25,25,25	0
3	MG	G	602	1/1	0.99	0.03	21,21,21,21	0
3	MG	A	602	1/1	0.99	0.04	29,29,29,29	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.

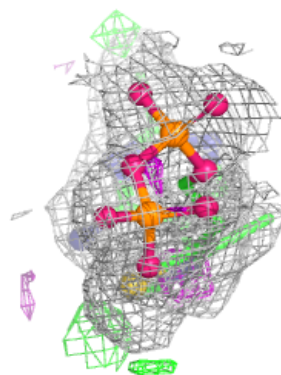
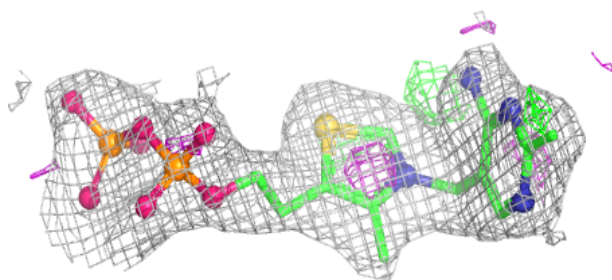
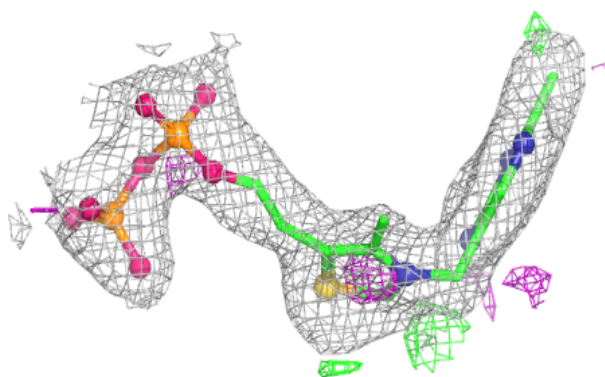
Electron density around TPP F 601:

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

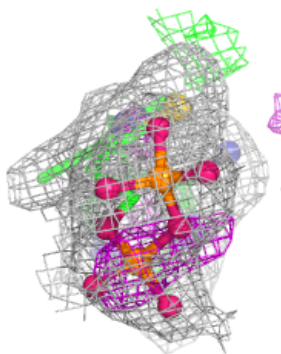
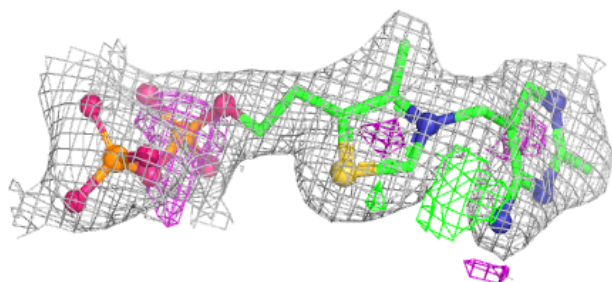
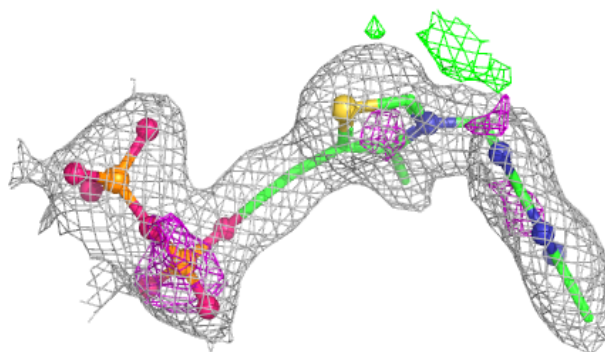


Electron density around TPP H 601:

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

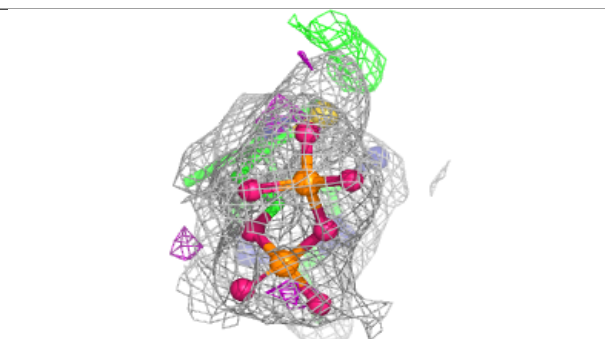
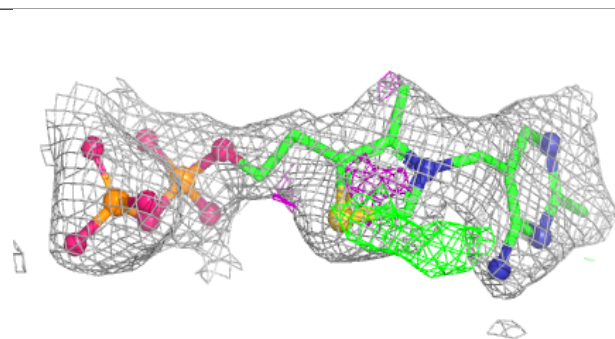
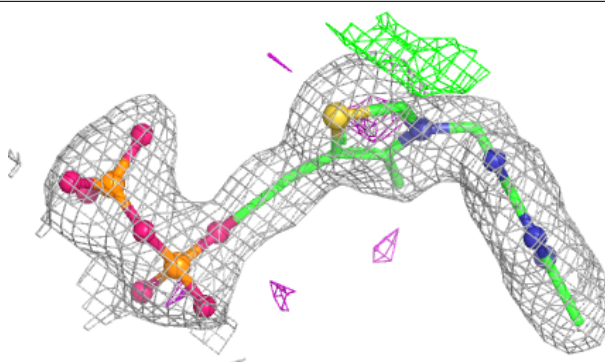
**Electron density around TPP A 601:**

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

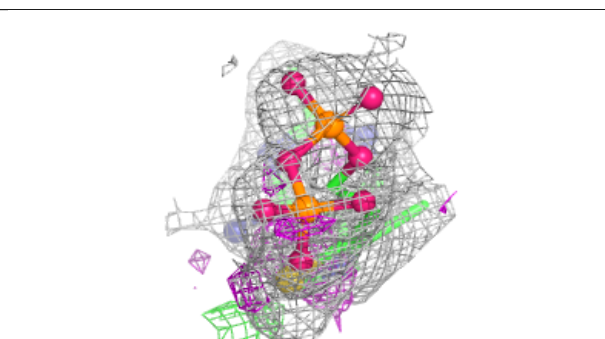
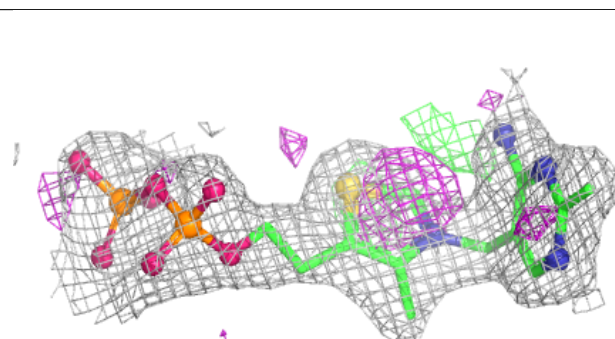
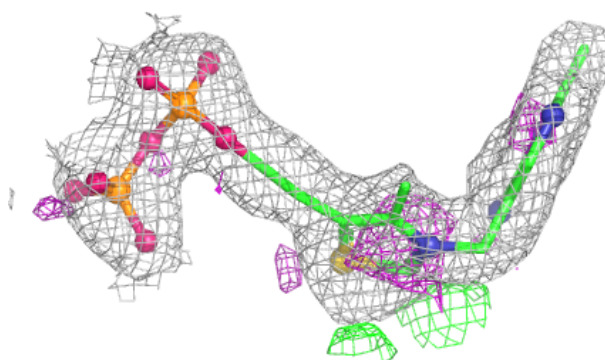


Electron density around TPP G 601:

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

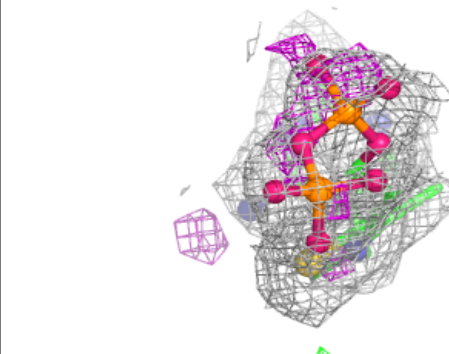
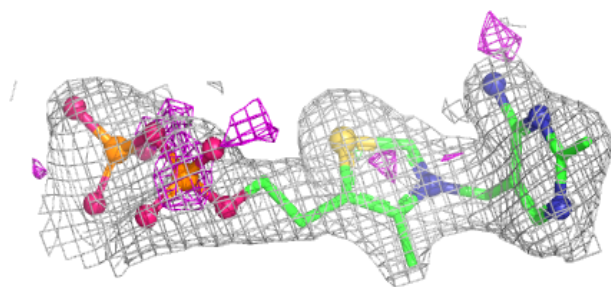
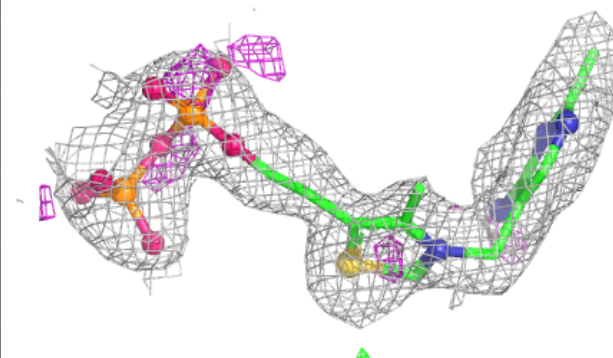
**Electron density around TPP E 601:**

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

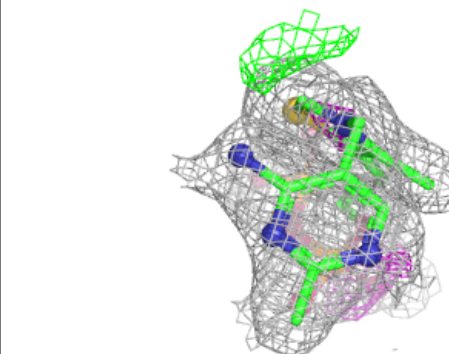
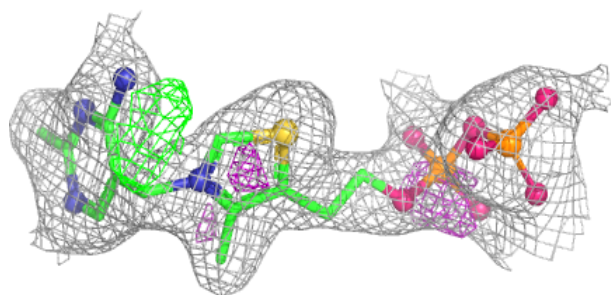
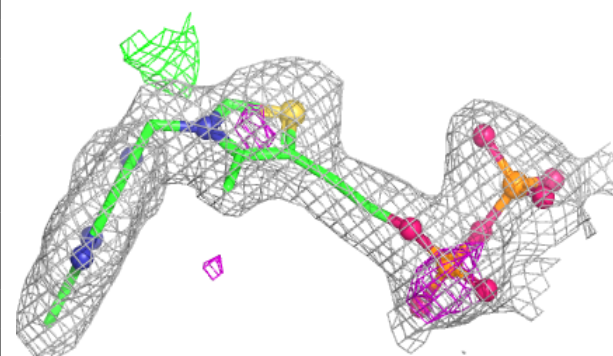


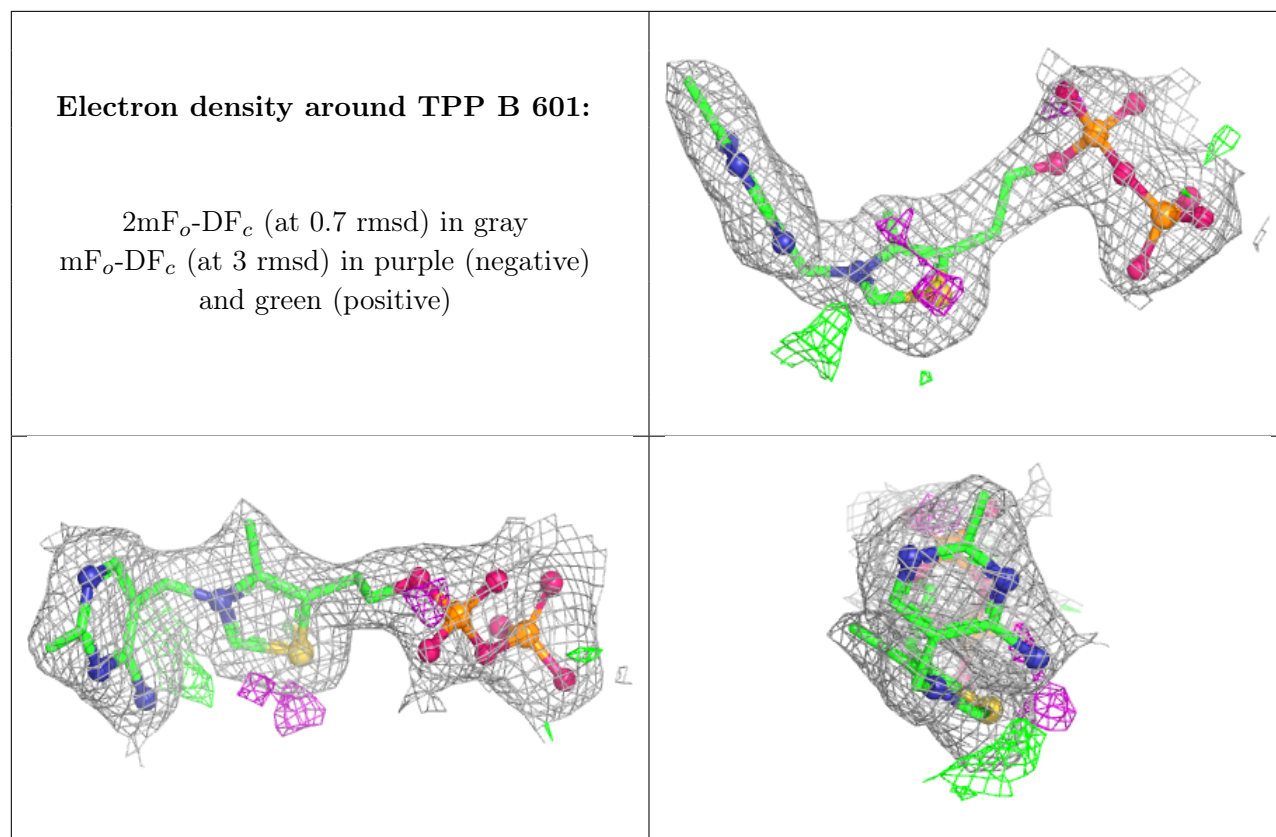
Electron density around TPP D 601:

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

**Electron density around TPP 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)





6.5 Other polymers [i](#)

There are no such residues in this entry.