



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 6, 2026 – 03:27 AM UTC

PDB ID : 4QPZ / pdb_00004qpz
Title : Crystal structure of the formolase FLS_v2 in space group P 21
Authors : Shen, B.W.; Siegel, J.B.; Stoddard, B.L.; Baker, D.
Deposited on : 2014-06-25
Resolution : 3.00 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

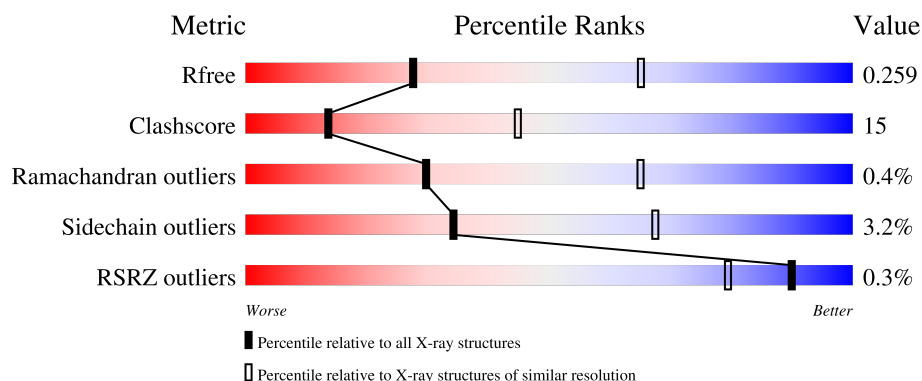
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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	2672 (3.00-3.00)
Clashscore	190562	2977 (3.00-3.00)
Ramachandran outliers	187476	2877 (3.00-3.00)
Sidechain outliers	187428	2880 (3.00-3.00)
RSRZ outliers	180081	2671 (3.00-3.00)

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	582	 67% 28% . .
1	B	582	 71% 24% . .
1	C	582	 73% 23% . .
1	D	582	 68% 28% . .
1	E	582	 71% 24% . .

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Mol	Chain	Length	Quality of chain
1	F	582	
1	G	582	
1	H	582	

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
3	TPP	H	602	-	-	X	-

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 33455 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 Formolase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	563	Total	C	N	O	S	0	0	0
			4157	2630	734	776	17			
1	B	562	Total	C	N	O	S	0	0	0
			4153	2628	733	775	17			
1	C	562	Total	C	N	O	S	0	0	0
			4153	2628	733	775	17			
1	D	562	Total	C	N	O	S	0	0	0
			4153	2628	733	775	17			
1	E	562	Total	C	N	O	S	0	0	0
			4153	2628	733	775	17			
1	F	562	Total	C	N	O	S	0	0	0
			4153	2628	733	775	17			
1	G	562	Total	C	N	O	S	0	0	0
			4153	2628	733	775	17			
1	H	562	Total	C	N	O	S	0	0	0
			4153	2628	733	775	17			

There are 192 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	28	ILE	ALA	conflict	UNP Q9F4L3
A	394	GLY	ALA	conflict	UNP Q9F4L3
A	419	ASN	GLY	conflict	UNP Q9F4L3
A	480	TRP	ALA	conflict	UNP Q9F4L3
A	564	GLY	-	expression tag	UNP Q9F4L3
A	565	SER	-	expression tag	UNP Q9F4L3
A	566	THR	-	expression tag	UNP Q9F4L3
A	567	GLU	-	expression tag	UNP Q9F4L3
A	568	ASN	-	expression tag	UNP Q9F4L3
A	569	LEU	-	expression tag	UNP Q9F4L3
A	570	TYR	-	expression tag	UNP Q9F4L3
A	571	PHE	-	expression tag	UNP Q9F4L3
A	572	GLN	-	expression tag	UNP Q9F4L3

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Chain	Residue	Modelled	Actual	Comment	Reference
A	573	SER	-	expression tag	UNP Q9F4L3
A	574	GLY	-	expression tag	UNP Q9F4L3
A	575	ALA	-	expression tag	UNP Q9F4L3
A	576	LEU	-	expression tag	UNP Q9F4L3
A	577	GLU	-	expression tag	UNP Q9F4L3
A	578	HIS	-	expression tag	UNP Q9F4L3
A	579	HIS	-	expression tag	UNP Q9F4L3
A	580	HIS	-	expression tag	UNP Q9F4L3
A	581	HIS	-	expression tag	UNP Q9F4L3
A	582	HIS	-	expression tag	UNP Q9F4L3
A	583	HIS	-	expression tag	UNP Q9F4L3
B	28	ILE	ALA	conflict	UNP Q9F4L3
B	394	GLY	ALA	conflict	UNP Q9F4L3
B	419	ASN	GLY	conflict	UNP Q9F4L3
B	480	TRP	ALA	conflict	UNP Q9F4L3
B	564	GLY	-	expression tag	UNP Q9F4L3
B	565	SER	-	expression tag	UNP Q9F4L3
B	566	THR	-	expression tag	UNP Q9F4L3
B	567	GLU	-	expression tag	UNP Q9F4L3
B	568	ASN	-	expression tag	UNP Q9F4L3
B	569	LEU	-	expression tag	UNP Q9F4L3
B	570	TYR	-	expression tag	UNP Q9F4L3
B	571	PHE	-	expression tag	UNP Q9F4L3
B	572	GLN	-	expression tag	UNP Q9F4L3
B	573	SER	-	expression tag	UNP Q9F4L3
B	574	GLY	-	expression tag	UNP Q9F4L3
B	575	ALA	-	expression tag	UNP Q9F4L3
B	576	LEU	-	expression tag	UNP Q9F4L3
B	577	GLU	-	expression tag	UNP Q9F4L3
B	578	HIS	-	expression tag	UNP Q9F4L3
B	579	HIS	-	expression tag	UNP Q9F4L3
B	580	HIS	-	expression tag	UNP Q9F4L3
B	581	HIS	-	expression tag	UNP Q9F4L3
B	582	HIS	-	expression tag	UNP Q9F4L3
B	583	HIS	-	expression tag	UNP Q9F4L3
C	28	ILE	ALA	conflict	UNP Q9F4L3
C	394	GLY	ALA	conflict	UNP Q9F4L3
C	419	ASN	GLY	conflict	UNP Q9F4L3
C	480	TRP	ALA	conflict	UNP Q9F4L3
C	564	GLY	-	expression tag	UNP Q9F4L3
C	565	SER	-	expression tag	UNP Q9F4L3
C	566	THR	-	expression tag	UNP Q9F4L3

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Chain	Residue	Modelled	Actual	Comment	Reference
C	567	GLU	-	expression tag	UNP Q9F4L3
C	568	ASN	-	expression tag	UNP Q9F4L3
C	569	LEU	-	expression tag	UNP Q9F4L3
C	570	TYR	-	expression tag	UNP Q9F4L3
C	571	PHE	-	expression tag	UNP Q9F4L3
C	572	GLN	-	expression tag	UNP Q9F4L3
C	573	SER	-	expression tag	UNP Q9F4L3
C	574	GLY	-	expression tag	UNP Q9F4L3
C	575	ALA	-	expression tag	UNP Q9F4L3
C	576	LEU	-	expression tag	UNP Q9F4L3
C	577	GLU	-	expression tag	UNP Q9F4L3
C	578	HIS	-	expression tag	UNP Q9F4L3
C	579	HIS	-	expression tag	UNP Q9F4L3
C	580	HIS	-	expression tag	UNP Q9F4L3
C	581	HIS	-	expression tag	UNP Q9F4L3
C	582	HIS	-	expression tag	UNP Q9F4L3
C	583	HIS	-	expression tag	UNP Q9F4L3
D	28	ILE	ALA	conflict	UNP Q9F4L3
D	394	GLY	ALA	conflict	UNP Q9F4L3
D	419	ASN	GLY	conflict	UNP Q9F4L3
D	480	TRP	ALA	conflict	UNP Q9F4L3
D	564	GLY	-	expression tag	UNP Q9F4L3
D	565	SER	-	expression tag	UNP Q9F4L3
D	566	THR	-	expression tag	UNP Q9F4L3
D	567	GLU	-	expression tag	UNP Q9F4L3
D	568	ASN	-	expression tag	UNP Q9F4L3
D	569	LEU	-	expression tag	UNP Q9F4L3
D	570	TYR	-	expression tag	UNP Q9F4L3
D	571	PHE	-	expression tag	UNP Q9F4L3
D	572	GLN	-	expression tag	UNP Q9F4L3
D	573	SER	-	expression tag	UNP Q9F4L3
D	574	GLY	-	expression tag	UNP Q9F4L3
D	575	ALA	-	expression tag	UNP Q9F4L3
D	576	LEU	-	expression tag	UNP Q9F4L3
D	577	GLU	-	expression tag	UNP Q9F4L3
D	578	HIS	-	expression tag	UNP Q9F4L3
D	579	HIS	-	expression tag	UNP Q9F4L3
D	580	HIS	-	expression tag	UNP Q9F4L3
D	581	HIS	-	expression tag	UNP Q9F4L3
D	582	HIS	-	expression tag	UNP Q9F4L3
D	583	HIS	-	expression tag	UNP Q9F4L3
E	28	ILE	ALA	conflict	UNP Q9F4L3

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Chain	Residue	Modelled	Actual	Comment	Reference
E	394	GLY	ALA	conflict	UNP Q9F4L3
E	419	ASN	GLY	conflict	UNP Q9F4L3
E	480	TRP	ALA	conflict	UNP Q9F4L3
E	564	GLY	-	expression tag	UNP Q9F4L3
E	565	SER	-	expression tag	UNP Q9F4L3
E	566	THR	-	expression tag	UNP Q9F4L3
E	567	GLU	-	expression tag	UNP Q9F4L3
E	568	ASN	-	expression tag	UNP Q9F4L3
E	569	LEU	-	expression tag	UNP Q9F4L3
E	570	TYR	-	expression tag	UNP Q9F4L3
E	571	PHE	-	expression tag	UNP Q9F4L3
E	572	GLN	-	expression tag	UNP Q9F4L3
E	573	SER	-	expression tag	UNP Q9F4L3
E	574	GLY	-	expression tag	UNP Q9F4L3
E	575	ALA	-	expression tag	UNP Q9F4L3
E	576	LEU	-	expression tag	UNP Q9F4L3
E	577	GLU	-	expression tag	UNP Q9F4L3
E	578	HIS	-	expression tag	UNP Q9F4L3
E	579	HIS	-	expression tag	UNP Q9F4L3
E	580	HIS	-	expression tag	UNP Q9F4L3
E	581	HIS	-	expression tag	UNP Q9F4L3
E	582	HIS	-	expression tag	UNP Q9F4L3
E	583	HIS	-	expression tag	UNP Q9F4L3
F	28	ILE	ALA	conflict	UNP Q9F4L3
F	394	GLY	ALA	conflict	UNP Q9F4L3
F	419	ASN	GLY	conflict	UNP Q9F4L3
F	480	TRP	ALA	conflict	UNP Q9F4L3
F	564	GLY	-	expression tag	UNP Q9F4L3
F	565	SER	-	expression tag	UNP Q9F4L3
F	566	THR	-	expression tag	UNP Q9F4L3
F	567	GLU	-	expression tag	UNP Q9F4L3
F	568	ASN	-	expression tag	UNP Q9F4L3
F	569	LEU	-	expression tag	UNP Q9F4L3
F	570	TYR	-	expression tag	UNP Q9F4L3
F	571	PHE	-	expression tag	UNP Q9F4L3
F	572	GLN	-	expression tag	UNP Q9F4L3
F	573	SER	-	expression tag	UNP Q9F4L3
F	574	GLY	-	expression tag	UNP Q9F4L3
F	575	ALA	-	expression tag	UNP Q9F4L3
F	576	LEU	-	expression tag	UNP Q9F4L3
F	577	GLU	-	expression tag	UNP Q9F4L3
F	578	HIS	-	expression tag	UNP Q9F4L3

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Chain	Residue	Modelled	Actual	Comment	Reference
F	579	HIS	-	expression tag	UNP Q9F4L3
F	580	HIS	-	expression tag	UNP Q9F4L3
F	581	HIS	-	expression tag	UNP Q9F4L3
F	582	HIS	-	expression tag	UNP Q9F4L3
F	583	HIS	-	expression tag	UNP Q9F4L3
G	28	ILE	ALA	conflict	UNP Q9F4L3
G	394	GLY	ALA	conflict	UNP Q9F4L3
G	419	ASN	GLY	conflict	UNP Q9F4L3
G	480	TRP	ALA	conflict	UNP Q9F4L3
G	564	GLY	-	expression tag	UNP Q9F4L3
G	565	SER	-	expression tag	UNP Q9F4L3
G	566	THR	-	expression tag	UNP Q9F4L3
G	567	GLU	-	expression tag	UNP Q9F4L3
G	568	ASN	-	expression tag	UNP Q9F4L3
G	569	LEU	-	expression tag	UNP Q9F4L3
G	570	TYR	-	expression tag	UNP Q9F4L3
G	571	PHE	-	expression tag	UNP Q9F4L3
G	572	GLN	-	expression tag	UNP Q9F4L3
G	573	SER	-	expression tag	UNP Q9F4L3
G	574	GLY	-	expression tag	UNP Q9F4L3
G	575	ALA	-	expression tag	UNP Q9F4L3
G	576	LEU	-	expression tag	UNP Q9F4L3
G	577	GLU	-	expression tag	UNP Q9F4L3
G	578	HIS	-	expression tag	UNP Q9F4L3
G	579	HIS	-	expression tag	UNP Q9F4L3
G	580	HIS	-	expression tag	UNP Q9F4L3
G	581	HIS	-	expression tag	UNP Q9F4L3
G	582	HIS	-	expression tag	UNP Q9F4L3
G	583	HIS	-	expression tag	UNP Q9F4L3
H	28	ILE	ALA	conflict	UNP Q9F4L3
H	394	GLY	ALA	conflict	UNP Q9F4L3
H	419	ASN	GLY	conflict	UNP Q9F4L3
H	480	TRP	ALA	conflict	UNP Q9F4L3
H	564	GLY	-	expression tag	UNP Q9F4L3
H	565	SER	-	expression tag	UNP Q9F4L3
H	566	THR	-	expression tag	UNP Q9F4L3
H	567	GLU	-	expression tag	UNP Q9F4L3
H	568	ASN	-	expression tag	UNP Q9F4L3
H	569	LEU	-	expression tag	UNP Q9F4L3
H	570	TYR	-	expression tag	UNP Q9F4L3
H	571	PHE	-	expression tag	UNP Q9F4L3
H	572	GLN	-	expression tag	UNP Q9F4L3

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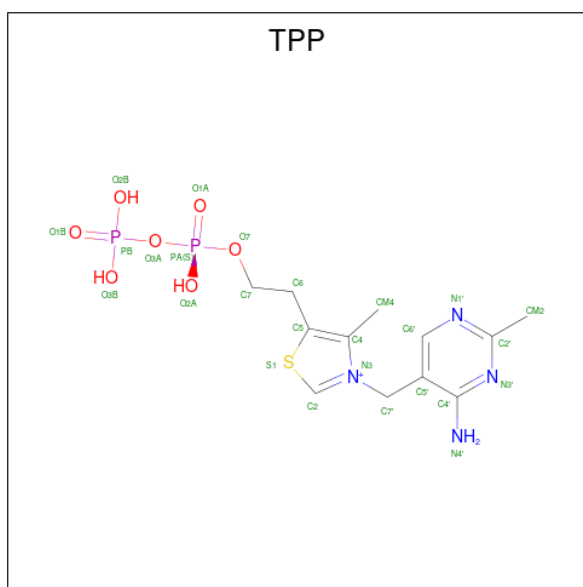
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Chain	Residue	Modelled	Actual	Comment	Reference
H	573	SER	-	expression tag	UNP Q9F4L3
H	574	GLY	-	expression tag	UNP Q9F4L3
H	575	ALA	-	expression tag	UNP Q9F4L3
H	576	LEU	-	expression tag	UNP Q9F4L3
H	577	GLU	-	expression tag	UNP Q9F4L3
H	578	HIS	-	expression tag	UNP Q9F4L3
H	579	HIS	-	expression tag	UNP Q9F4L3
H	580	HIS	-	expression tag	UNP Q9F4L3
H	581	HIS	-	expression tag	UNP Q9F4L3
H	582	HIS	-	expression tag	UNP Q9F4L3
H	583	HIS	-	expression tag	UNP Q9F4L3

- Molecule 2 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

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

- Molecule 3 is THIAMINE DIPHOSPHATE (CCD ID: TPP) (formula: C₁₂H₁₉N₄O₇P₂S).



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

- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	1	Total O 1 1	0	0
4	D	2	Total O 2 2	0	0
4	E	3	Total O 3 3	0	0
4	F	2	Total O 2 2	0	0

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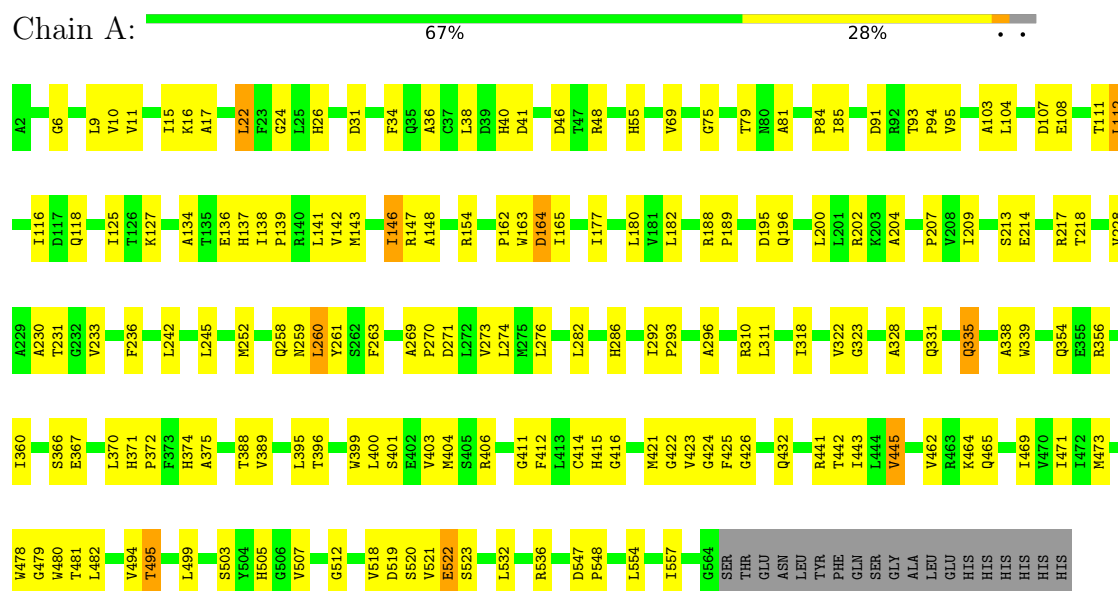
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	G	3	Total	O	0	0
			3	3		

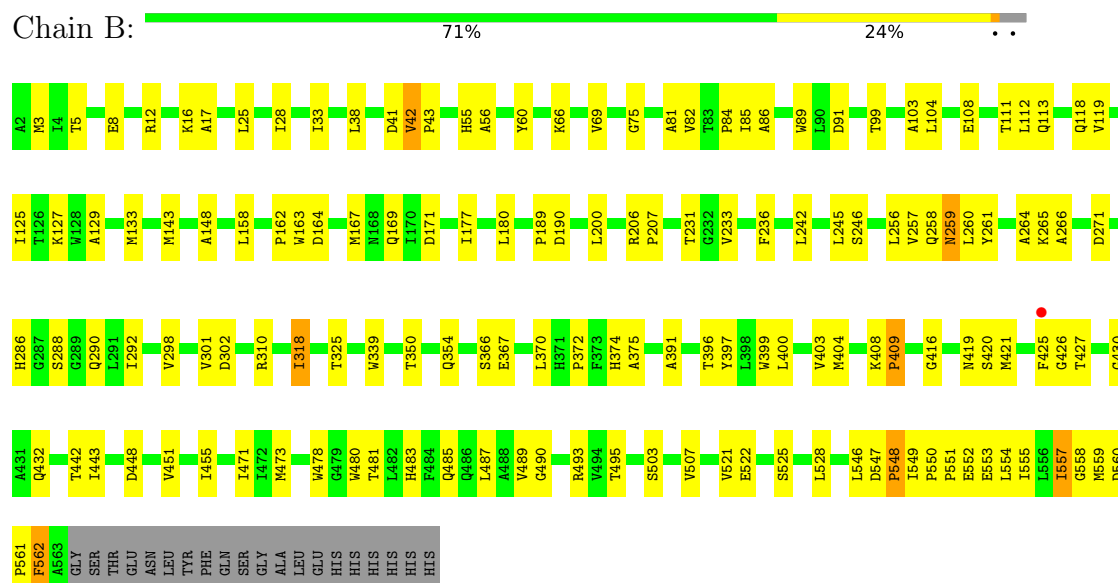
3 Residue-property plots

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: Formolase

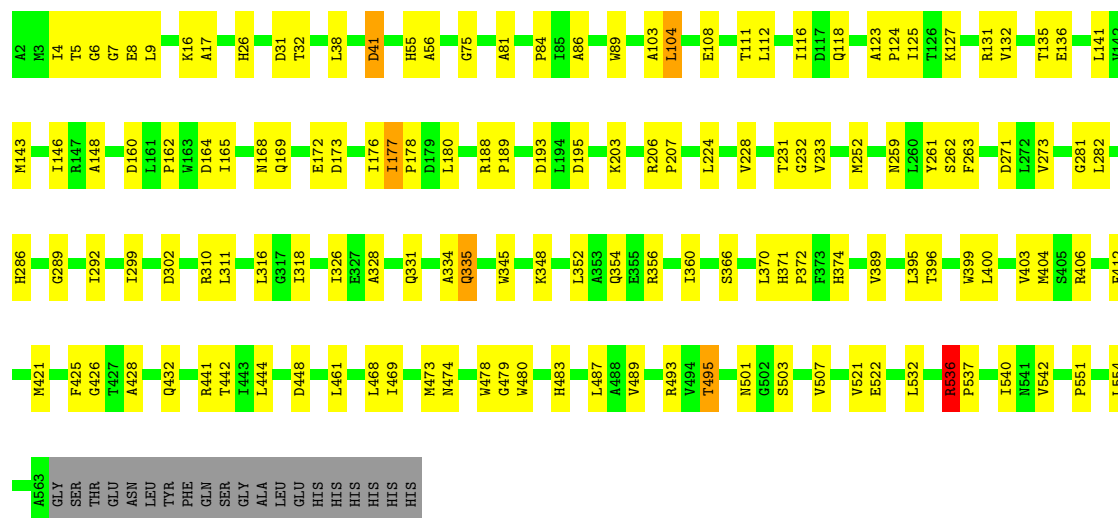


• Molecule 1: Formolase



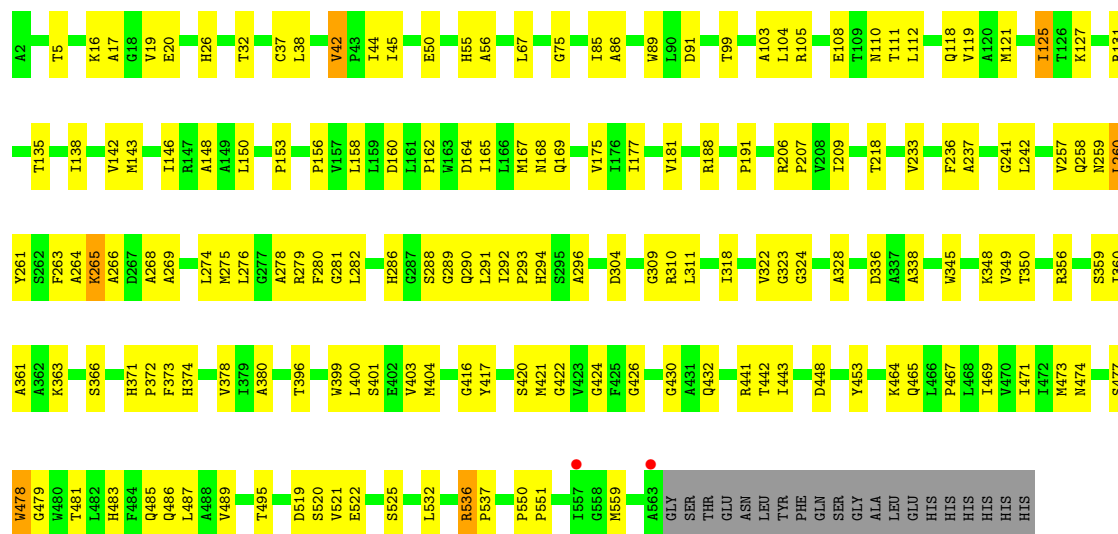
- Molecule 1: Formolase

Chain C:  73% 23% ..



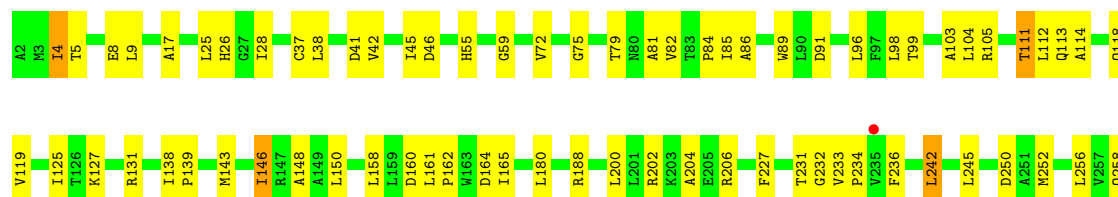
- Molecule 1: Formolase

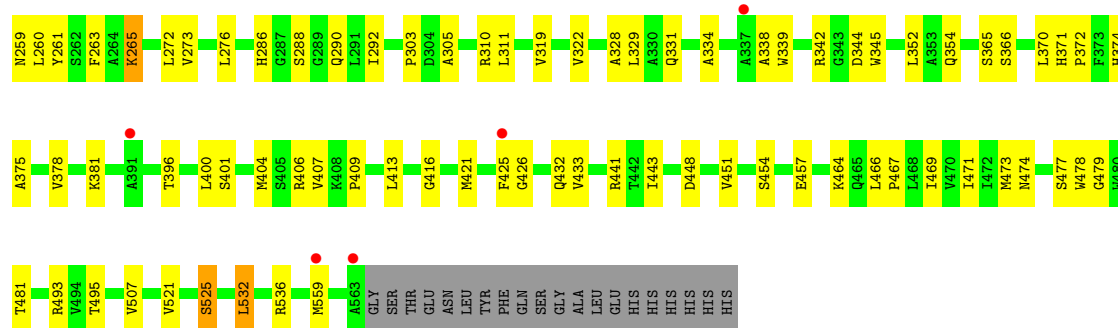
Chain D:  68% 28% ..



- Molecule 1: Formolase

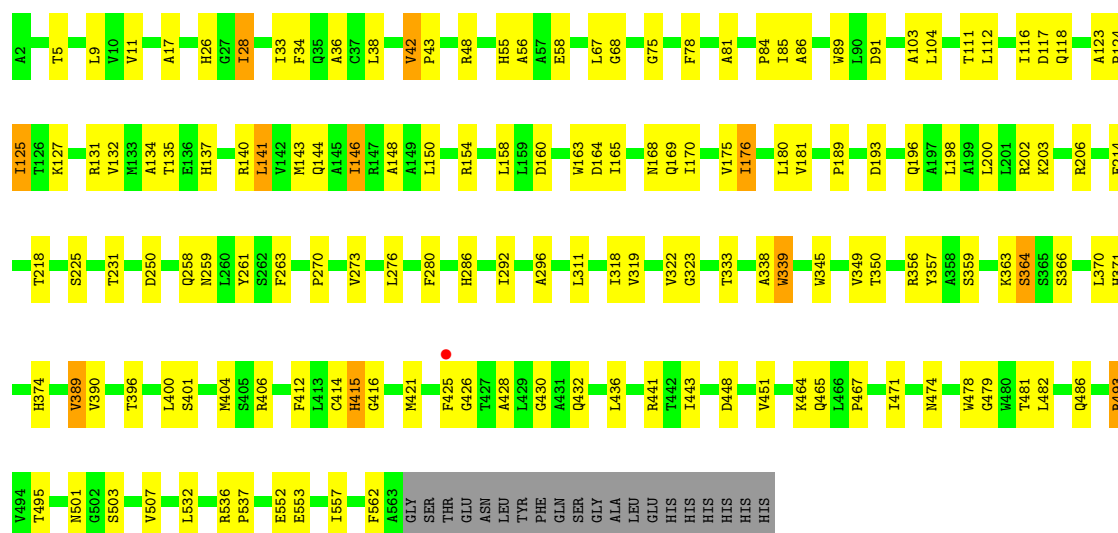
Chain E:  71% 24% ..





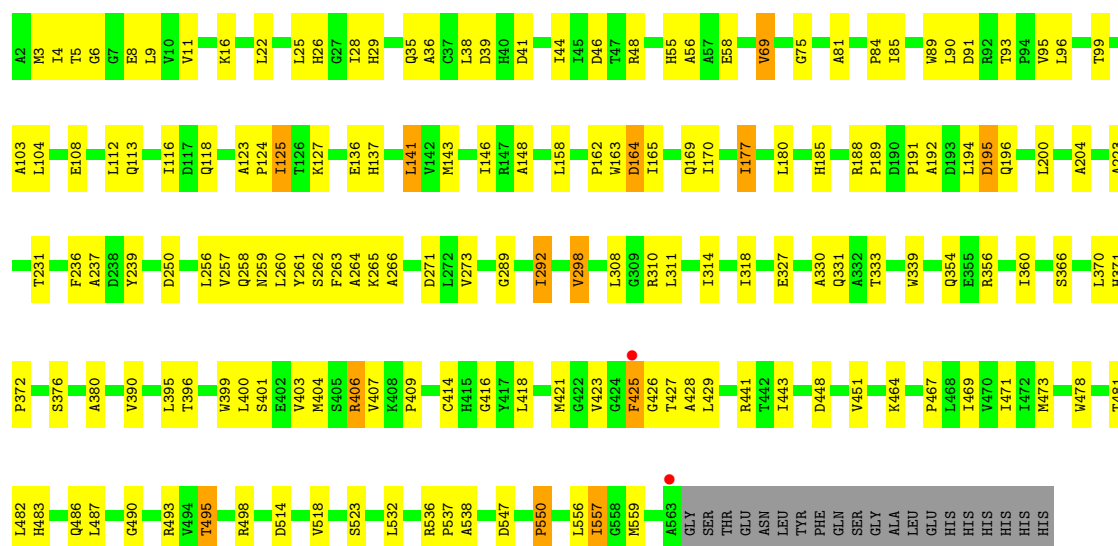
• Molecule 1: Formolase

Chain F: 71% 24%



• Molecule 1: Formolase

Chain G: 68% 26%



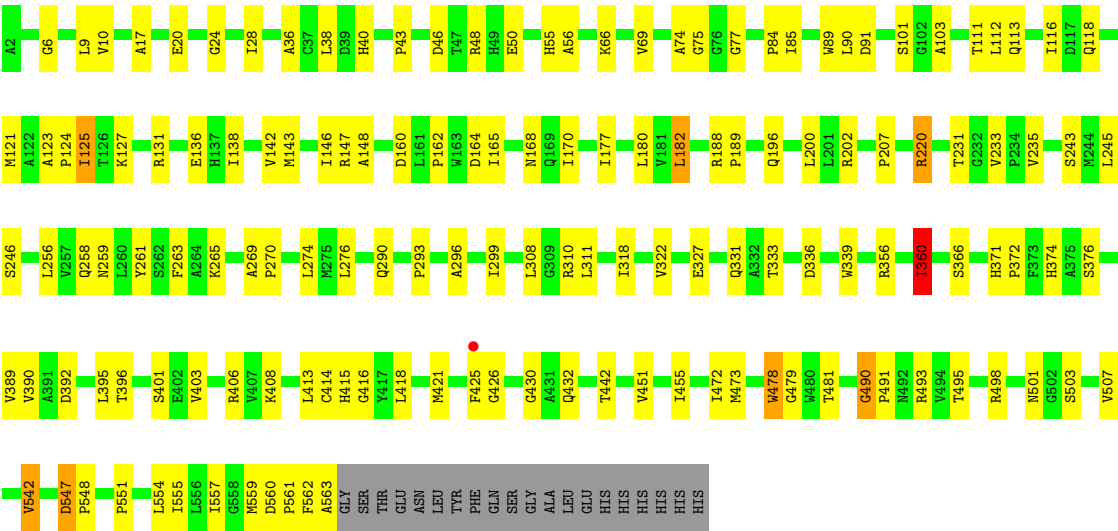
● Molecule 1: Formolase

Chain H:

71%

24%

..



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	99.88Å 136.56Å 167.06Å 90.00° 95.36° 90.00°	Depositor
Resolution (Å)	166.33 – 3.00 166.33 – 3.00	Depositor EDS
% Data completeness (in resolution range)	89.4 (166.33-3.00) 89.4 (166.33-3.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.10	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.49 (at 3.01Å)	Xtriage
Refinement program	REFMAC 5.8.0071	Depositor
R, R_{free}	0.208 , 0.257 0.212 , 0.259	Depositor DCC
R_{free} test set	4028 reflections (4.50%)	wwPDB-VP
Wilson B-factor (Å ²)	59.6	Xtriage
Anisotropy	0.152	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 34.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.35$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	33455	wwPDB-VP
Average B, all atoms (Å ²)	67.0	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 45.33 % 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 1.3419e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: 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	0.71	0/4244	1.08	5/5789 (0.1%)
1	B	0.76	1/4240 (0.0%)	1.10	11/5784 (0.2%)
1	C	0.74	0/4240	1.11	8/5784 (0.1%)
1	D	0.72	0/4240	1.07	5/5784 (0.1%)
1	E	0.73	0/4240	1.09	12/5784 (0.2%)
1	F	0.74	1/4240 (0.0%)	1.08	7/5784 (0.1%)
1	G	0.75	0/4240	1.09	12/5784 (0.2%)
1	H	0.76	0/4240	1.09	8/5784 (0.1%)
All	All	0.74	2/33924 (0.0%)	1.09	68/46277 (0.1%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	409	PRO	N-CD	-5.49	1.40	1.47
1	F	415	HIS	CA-C	-5.02	1.46	1.52

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	G	490	GLY	CA-C-N	8.75	128.34	119.24
1	G	490	GLY	C-N-CA	8.75	128.34	119.24
1	E	536	ARG	CA-C-N	8.51	128.52	119.76
1	E	536	ARG	C-N-CA	8.51	128.52	119.76
1	C	536	ARG	CA-C-N	7.53	127.99	119.93

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	4157	0	4143	145	0
1	B	4153	0	4140	119	0
1	C	4153	0	4140	113	0
1	D	4153	0	4140	150	0
1	E	4153	0	4140	127	0
1	F	4153	0	4140	120	0
1	G	4153	0	4140	131	0
1	H	4153	0	4140	115	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
2	E	1	0	0	0	0
2	F	1	0	0	0	0
2	G	1	0	0	0	0
2	H	1	0	0	0	0
3	A	26	0	16	6	0
3	B	26	0	16	7	0
3	C	26	0	16	8	0
3	D	26	0	16	8	0
3	E	26	0	16	6	0
3	F	26	0	16	8	0
3	G	26	0	16	7	0
3	H	26	0	16	9	0
4	B	1	0	0	0	0
4	D	2	0	0	0	0
4	E	3	0	0	0	0
4	F	2	0	0	0	0
4	G	3	0	0	0	0
All	All	33455	0	33251	976	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 15.

The worst 5 of 976 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:421:MET:HE3	3:H:602:TPP:S1	1.63	1.39
1:E:425:PHE:CZ	1:E:451:VAL:HG23	1.78	1.18
1:F:5:THR:HG22	1:F:169:GLN:HG2	1.27	1.13
1:F:196:GLN:O	1:F:200:LEU:HD13	1.50	1.11
1:G:38:LEU:HD13	1:H:495:THR:HG21	1.20	1.10

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	561/582 (96%)	524 (93%)	35 (6%)	2 (0%)	30	65
1	B	560/582 (96%)	522 (93%)	35 (6%)	3 (0%)	24	60
1	C	560/582 (96%)	529 (94%)	29 (5%)	2 (0%)	30	65
1	D	560/582 (96%)	517 (92%)	39 (7%)	4 (1%)	18	53
1	E	560/582 (96%)	532 (95%)	27 (5%)	1 (0%)	43	76
1	F	560/582 (96%)	531 (95%)	28 (5%)	1 (0%)	43	76
1	G	560/582 (96%)	528 (94%)	27 (5%)	5 (1%)	14	48
1	H	560/582 (96%)	530 (95%)	29 (5%)	1 (0%)	43	76
All	All	4481/4656 (96%)	4213 (94%)	249 (6%)	19 (0%)	30	65

5 of 19 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	548	PRO
1	C	41	ASP
1	D	265	LYS
1	D	290	GLN
1	F	117	ASP

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	421/438 (96%)	405 (96%)	16 (4%)	29	63
1	B	421/438 (96%)	409 (97%)	12 (3%)	37	70
1	C	421/438 (96%)	407 (97%)	14 (3%)	33	67
1	D	421/438 (96%)	411 (98%)	10 (2%)	43	73
1	E	421/438 (96%)	409 (97%)	12 (3%)	37	70
1	F	421/438 (96%)	407 (97%)	14 (3%)	33	67
1	G	421/438 (96%)	407 (97%)	14 (3%)	33	67
1	H	421/438 (96%)	405 (96%)	16 (4%)	29	63
All	All	3368/3504 (96%)	3260 (97%)	108 (3%)	34	67

5 of 108 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	331	GLN
1	F	176	ILE
1	H	265	LYS
1	E	365	SER
1	F	33	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 78 such sidechains are listed below:

Mol	Chain	Res	Type
1	F	534	HIS
1	H	286	HIS
1	G	118	GLN
1	H	40	HIS
1	H	432	GLN

5.3.3 RNA ⓘ

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 16 ligands modelled in this entry, 8 are monoatomic - leaving 8 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$
3	TPP	H	602	2	26,27,27	1.64	5 (19%)	38,40,40	2.19	9 (23%)
3	TPP	B	602	2	26,27,27	1.55	5 (19%)	38,40,40	2.19	10 (26%)
3	TPP	A	602	2	26,27,27	1.72	5 (19%)	38,40,40	2.22	10 (26%)
3	TPP	C	602	2	26,27,27	1.71	4 (15%)	38,40,40	1.99	7 (18%)
3	TPP	F	602	2	26,27,27	1.62	5 (19%)	38,40,40	1.85	8 (21%)
3	TPP	E	602	2	26,27,27	1.55	5 (19%)	38,40,40	2.20	9 (23%)
3	TPP	D	602	2	26,27,27	1.51	5 (19%)	38,40,40	2.29	9 (23%)
3	TPP	G	602	2	26,27,27	1.62	5 (19%)	38,40,40	2.33	8 (21%)

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
3	TPP	H	602	2	-	4/17/17/17	0/2/2/2
3	TPP	B	602	2	-	4/17/17/17	0/2/2/2
3	TPP	A	602	2	-	4/17/17/17	0/2/2/2
3	TPP	C	602	2	-	4/17/17/17	0/2/2/2

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	TPP	F	602	2	-	4/17/17/17	0/2/2/2
3	TPP	E	602	2	-	3/17/17/17	0/2/2/2
3	TPP	D	602	2	-	5/17/17/17	0/2/2/2
3	TPP	G	602	2	-	2/17/17/17	0/2/2/2

The worst 5 of 39 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	G	602	TPP	C5-C4	4.75	1.45	1.35
3	E	602	TPP	C5-C4	4.59	1.44	1.35
3	A	602	TPP	C5-C4	4.55	1.44	1.35
3	C	602	TPP	C5-C4	4.45	1.44	1.35
3	D	602	TPP	C5-C4	4.38	1.44	1.35

The worst 5 of 70 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	G	602	TPP	C2-S1-C5	10.57	98.22	91.22
3	D	602	TPP	C2-S1-C5	9.72	97.65	91.22
3	A	602	TPP	C2-S1-C5	9.46	97.48	91.22
3	E	602	TPP	C2-S1-C5	9.36	97.42	91.22
3	B	602	TPP	C2-S1-C5	9.02	97.19	91.22

There are no chirality outliers.

5 of 30 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	602	TPP	PA-O3A-PB-O3B
3	B	602	TPP	PA-O3A-PB-O3B
3	C	602	TPP	PA-O3A-PB-O3B
3	D	602	TPP	PA-O3A-PB-O3B
3	E	602	TPP	PA-O3A-PB-O3B

There are no ring outliers.

8 monomers are involved in 59 short contacts:

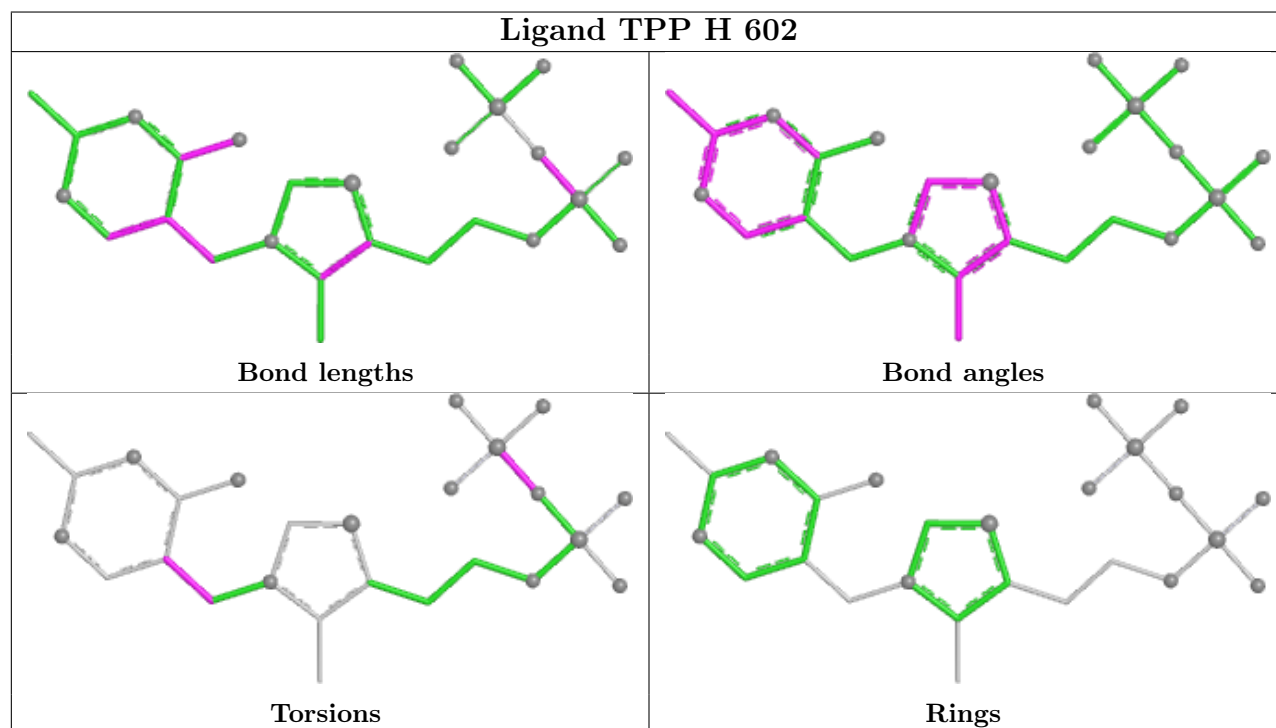
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	H	602	TPP	9	0
3	B	602	TPP	7	0
3	A	602	TPP	6	0

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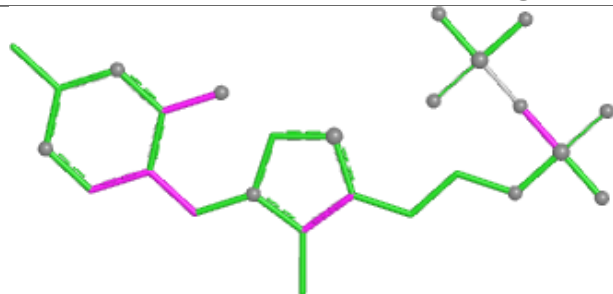
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Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	602	TPP	8	0
3	F	602	TPP	8	0
3	E	602	TPP	6	0
3	D	602	TPP	8	0
3	G	602	TPP	7	0

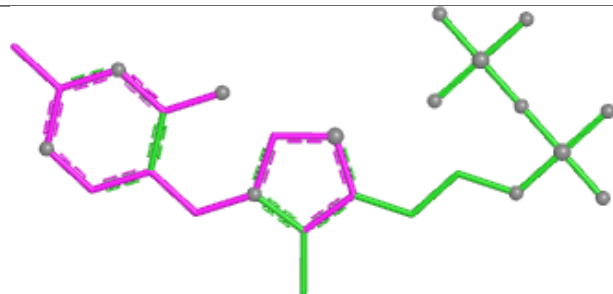
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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



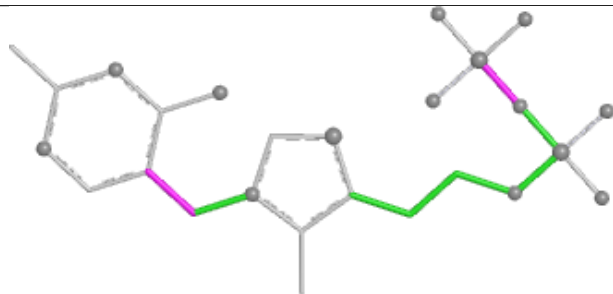
Ligand TPP B 602



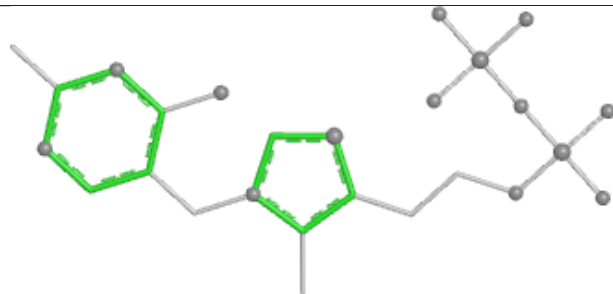
Bond lengths



Bond angles

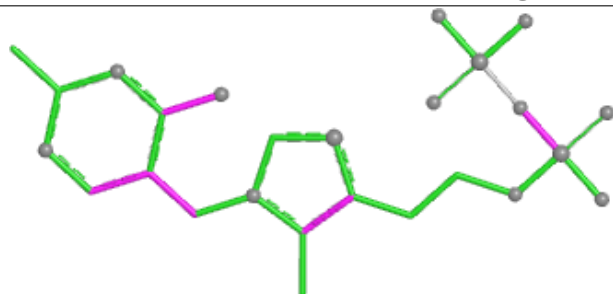


Torsions

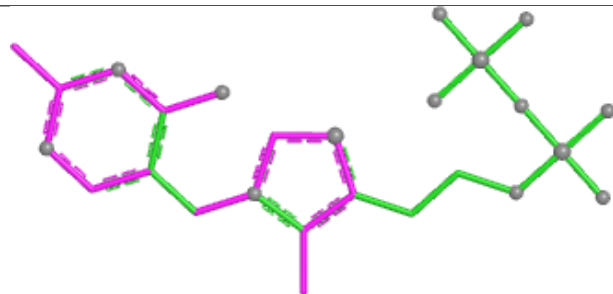


Rings

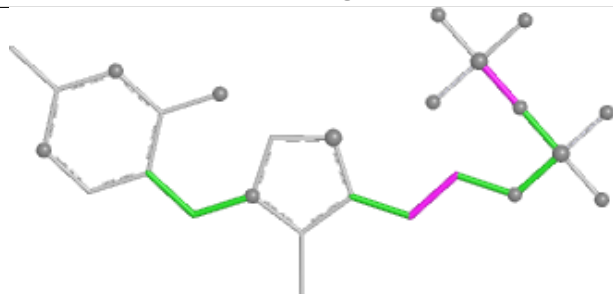
Ligand TPP A 602



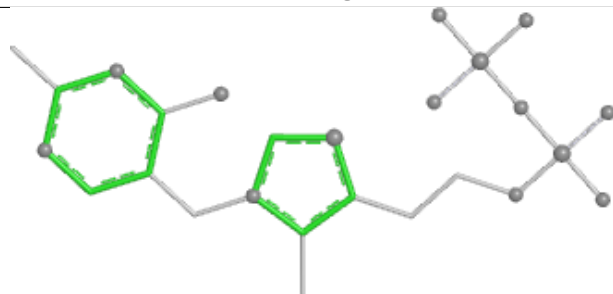
Bond lengths



Bond angles

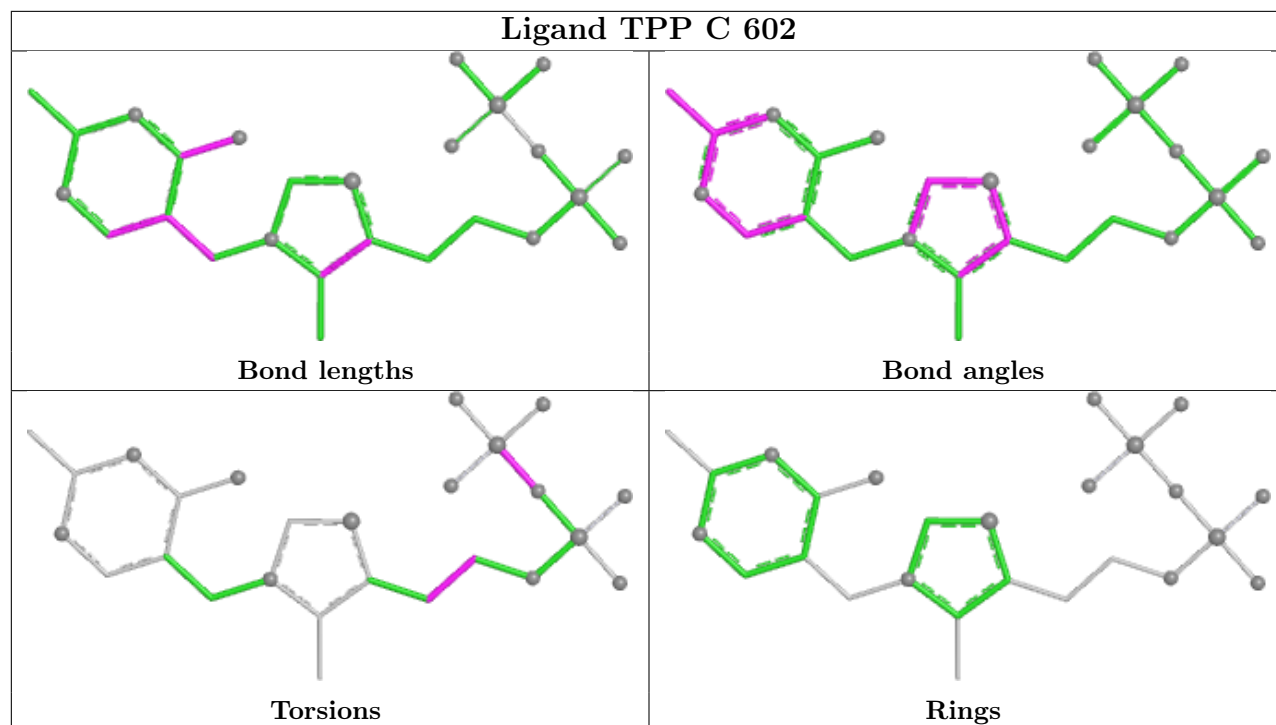


Torsions

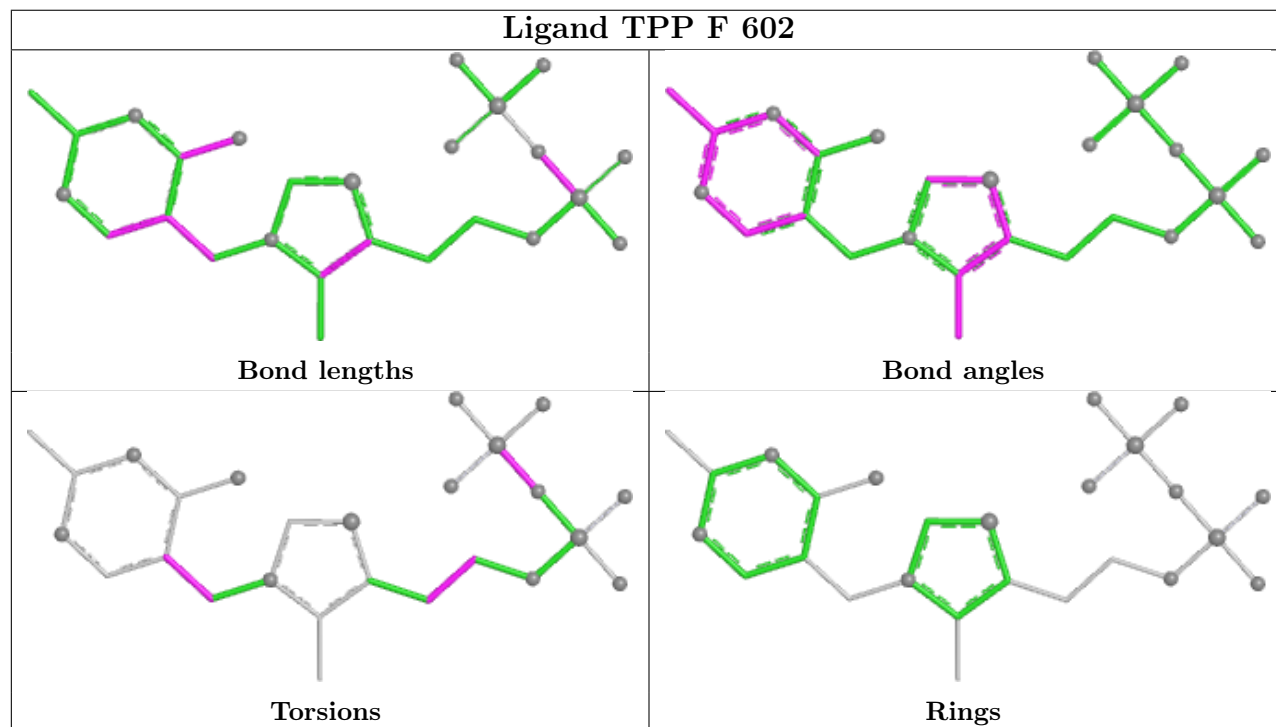


Rings

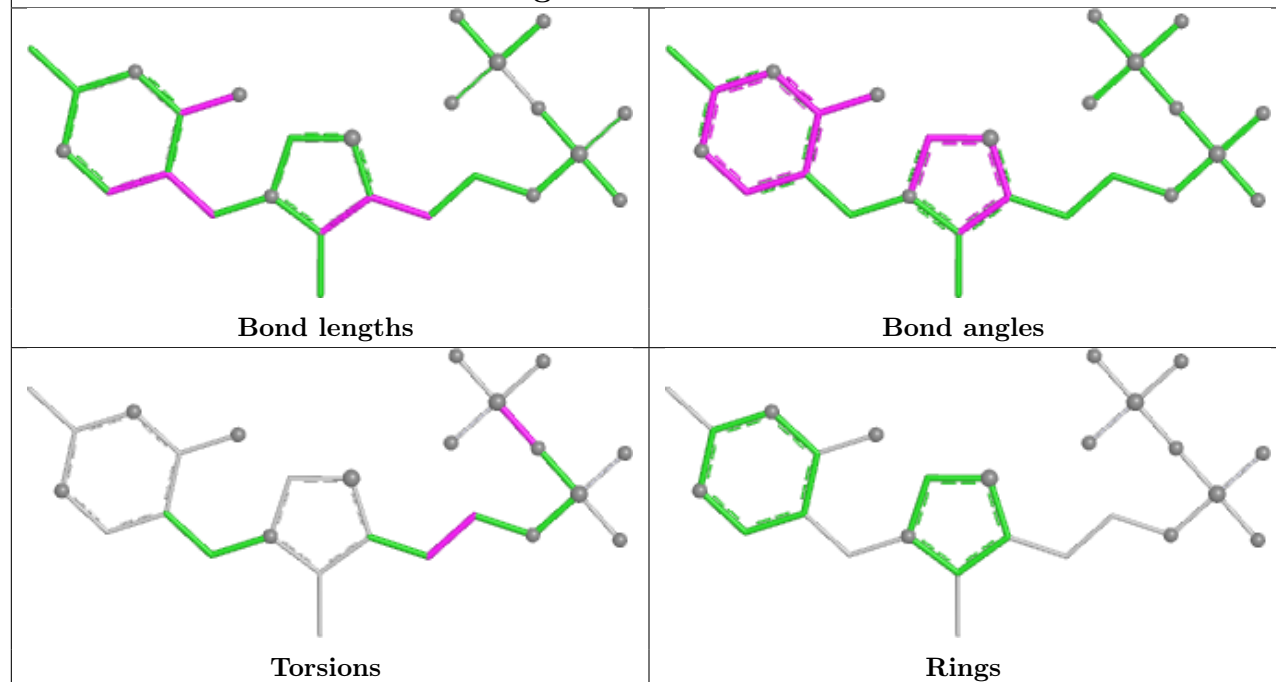
Ligand TPP C 602



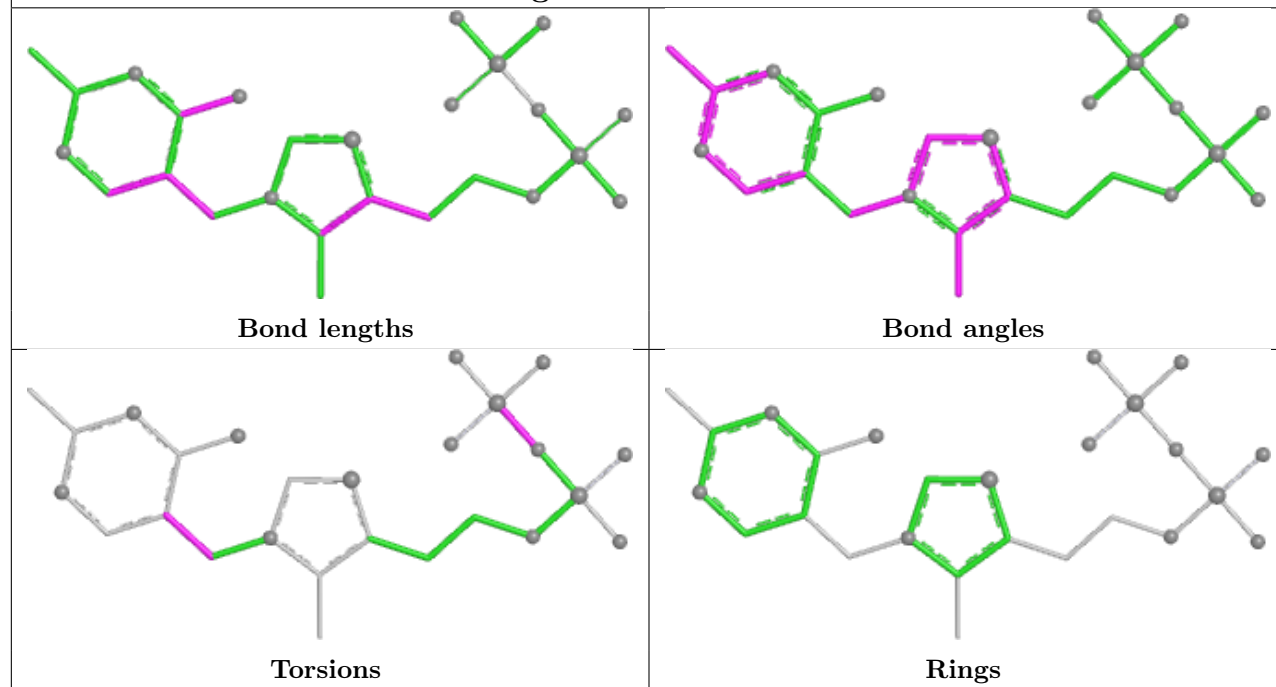
Ligand TPP F 602

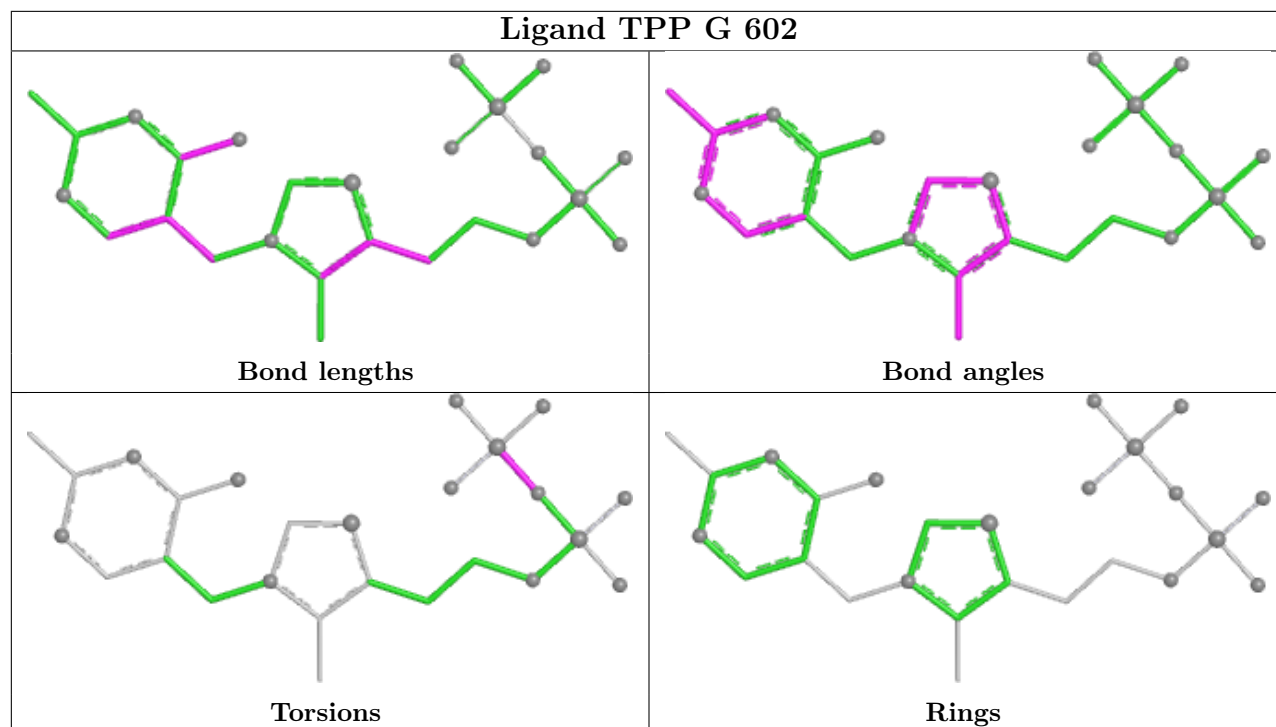


Ligand TPP E 602



Ligand TPP D 602





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	563/582 (96%)	-0.08	0 100 100	31, 65, 89, 116	0
1	B	562/582 (96%)	-0.05	1 (0%) 91 83	28, 64, 110, 146	0
1	C	562/582 (96%)	-0.15	0 100 100	30, 60, 88, 116	0
1	D	562/582 (96%)	0.11	2 (0%) 88 76	32, 72, 112, 132	0
1	E	562/582 (96%)	0.15	6 (1%) 78 57	31, 69, 115, 149	0
1	F	562/582 (96%)	-0.02	1 (0%) 91 83	32, 66, 97, 136	0
1	G	562/582 (96%)	-0.01	2 (0%) 88 76	22, 64, 116, 144	0
1	H	562/582 (96%)	-0.11	1 (0%) 91 83	26, 58, 97, 130	0
All	All	4497/4656 (96%)	-0.02	13 (0%) 90 79	22, 64, 107, 149	0

The worst 5 of 13 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	425	PHE	3.0
1	E	425	PHE	2.7
1	F	425	PHE	2.6
1	G	563	ALA	2.6
1	E	563	ALA	2.5

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 ⓘ

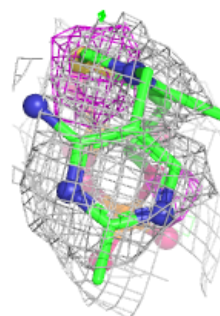
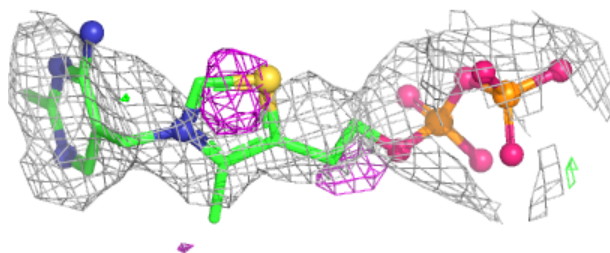
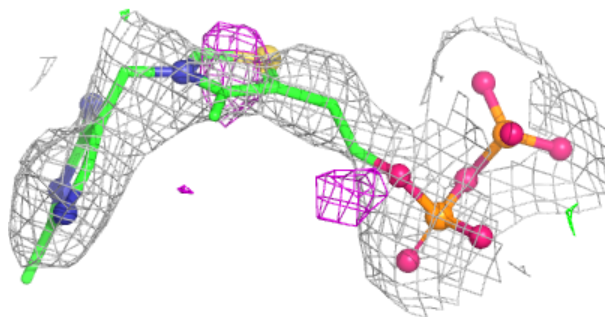
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	TPP	A	602	26/26	0.91	0.13	55,71,98,114	0
3	TPP	G	602	26/26	0.92	0.12	55,75,91,94	0
3	TPP	E	602	26/26	0.93	0.11	66,73,93,100	0
3	TPP	F	602	26/26	0.93	0.12	61,82,112,119	0
3	TPP	D	602	26/26	0.93	0.11	73,92,112,123	0
3	TPP	H	602	26/26	0.93	0.12	52,84,108,121	0
3	TPP	C	602	26/26	0.94	0.10	60,80,103,108	0
2	MG	A	601	1/1	0.94	0.13	56,56,56,56	0
3	TPP	B	602	26/26	0.94	0.11	77,95,120,126	0
2	MG	B	601	1/1	0.95	0.07	68,68,68,68	0
2	MG	C	601	1/1	0.96	0.06	49,49,49,49	0
2	MG	E	601	1/1	0.96	0.04	62,62,62,62	0
2	MG	D	601	1/1	0.97	0.05	75,75,75,75	0
2	MG	H	601	1/1	0.97	0.04	43,43,43,43	0
2	MG	G	601	1/1	0.98	0.09	36,36,36,36	0
2	MG	F	601	1/1	0.98	0.03	45,45,45,45	0

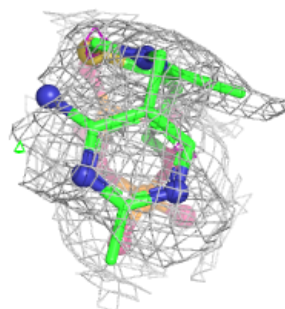
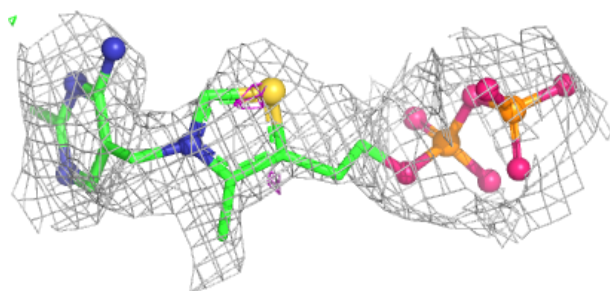
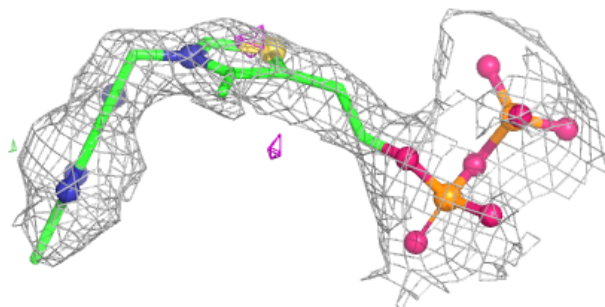
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around TPP A 602:

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

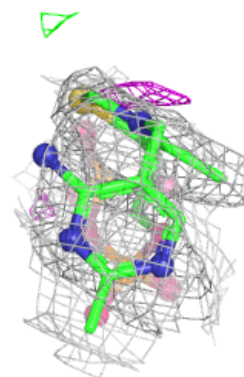
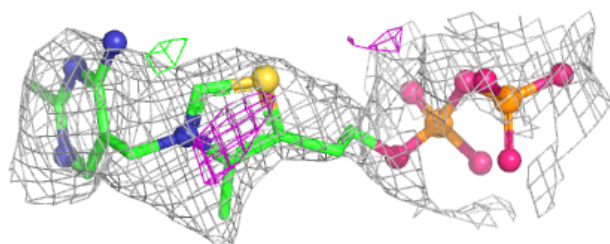
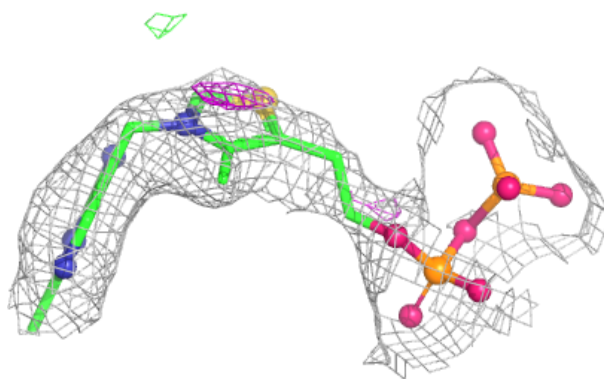
**Electron density around TPP G 602:**

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

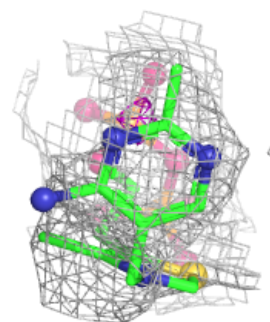
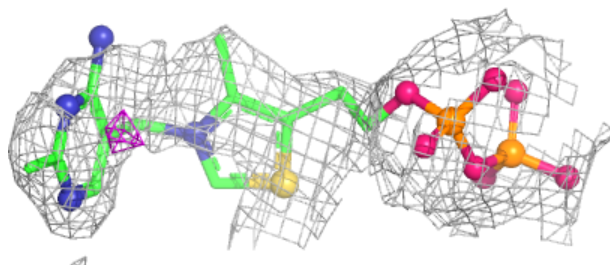
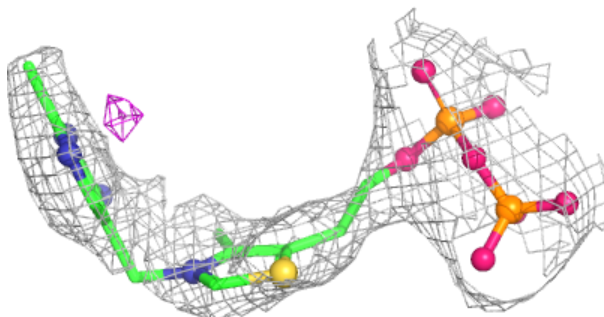


Electron density around TPP E 602:

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

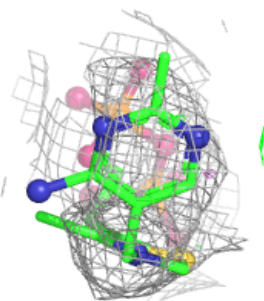
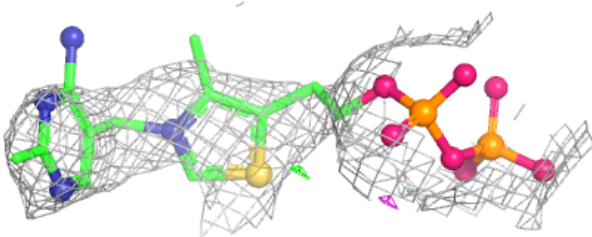
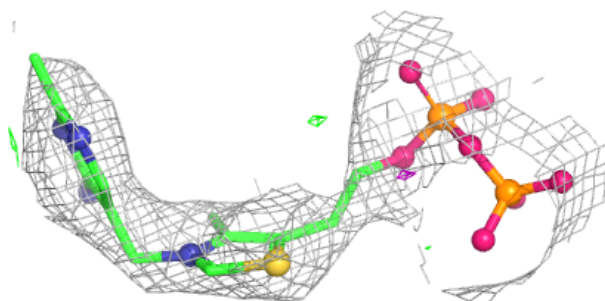
**Electron density around TPP F 602:**

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

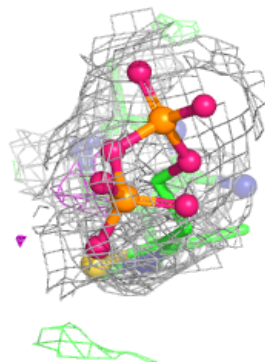
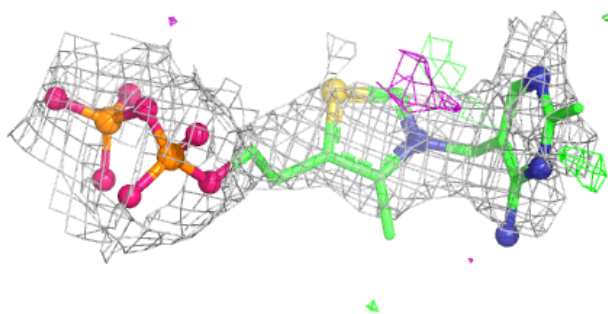
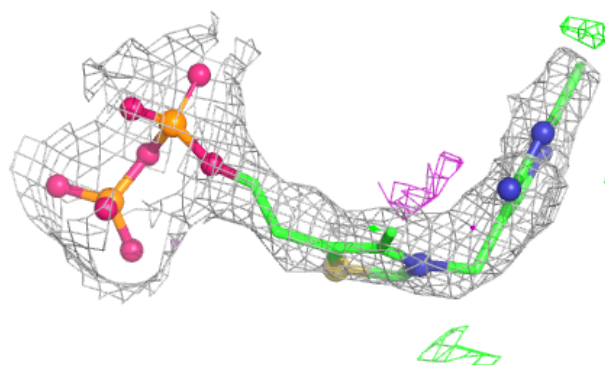


Electron density around TPP D 602:

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

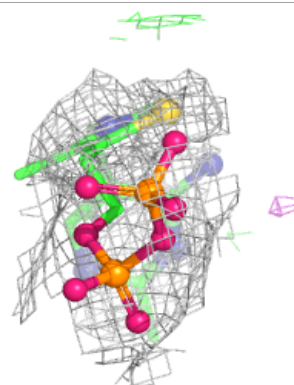
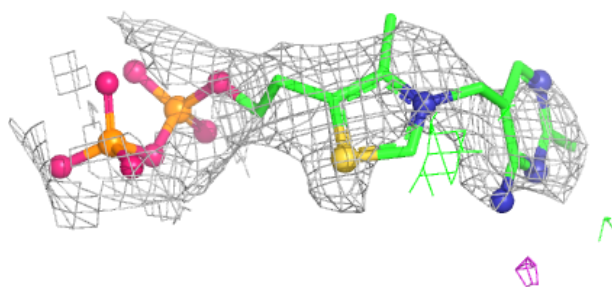
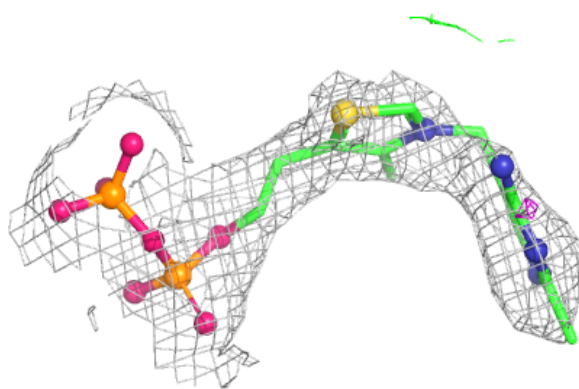
**Electron density around TPP H 602:**

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

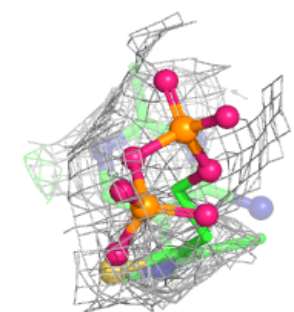
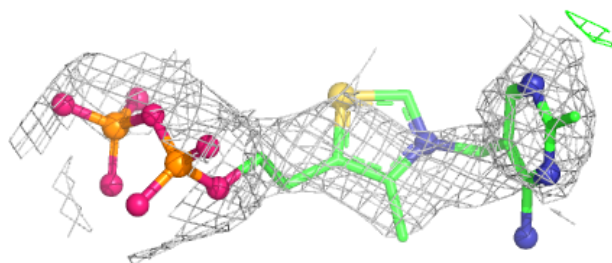
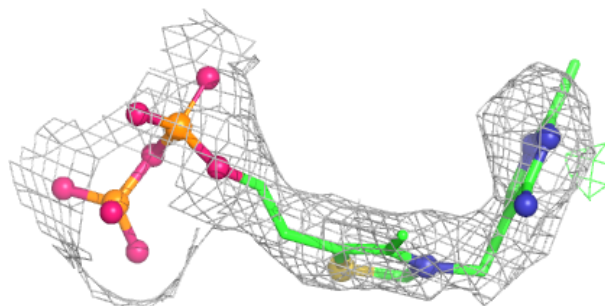


Electron density around TPP C 602:

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

**Electron density around TPP 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)



6.5 Other polymers [i](#)

There are no such residues in this entry.