



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 14, 2023 – 01:49 PM EDT

PDB ID : 7TIN
Title : The Structure of *S. aureus* MenD
Authors : Johnston, J.M.; Stanborough, T.; Ho, N.A.T.; Akazong, E.W.; Jiao, W.
Deposited on : 2022-01-14
Resolution : 2.35 Å(reported)

This is a Full wwPDB X-ray Structure Validation 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 : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36

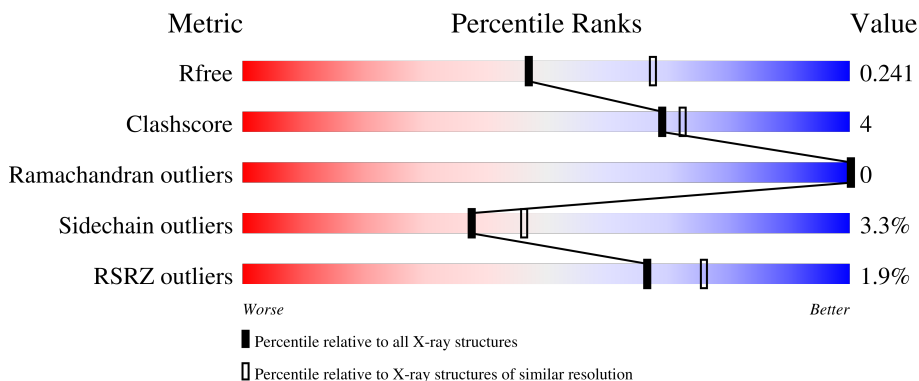
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.35 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}	130704	1164 (2.36-2.36)
Clashscore	141614	1232 (2.36-2.36)
Ramachandran outliers	138981	1211 (2.36-2.36)
Sidechain outliers	138945	1212 (2.36-2.36)
RSRZ outliers	127900	1150 (2.36-2.36)

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	559	
1	B	559	
1	C	559	
1	D	559	

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	GLY	C	603	-	X	-	-

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 18089 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.

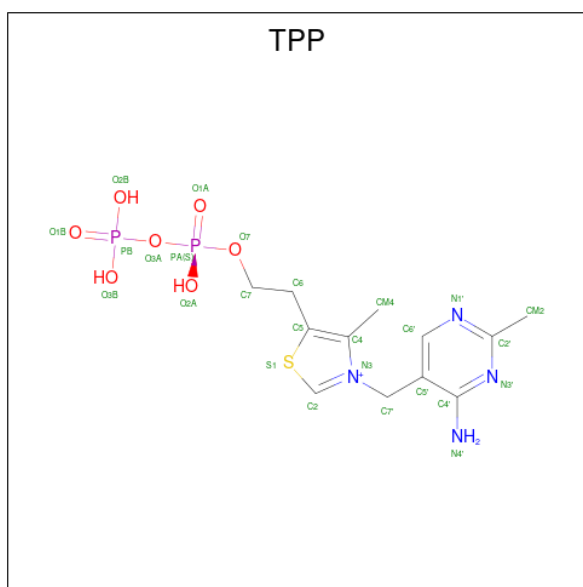
- Molecule 1 is a protein called 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylate synthase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	555	4419	2833	740	830	16	0	0	0
1	B	556	4433	2838	742	836	17	0	1	0
1	C	556	4426	2836	742	832	16	0	0	0
1	D	553	4415	2828	741	830	16	0	1	0

There are 8 discrepancies between the modelled and reference sequences:

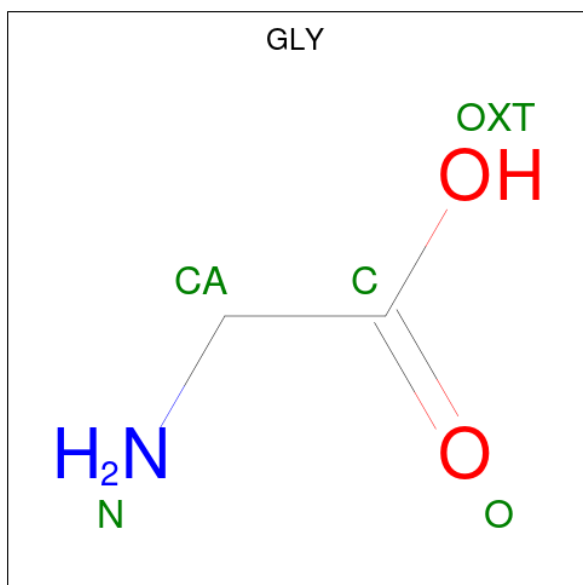
Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	expression tag	UNP A0A390C306
A	0	ALA	-	expression tag	UNP A0A390C306
B	-1	GLY	-	expression tag	UNP A0A390C306
B	0	ALA	-	expression tag	UNP A0A390C306
C	-1	GLY	-	expression tag	UNP A0A390C306
C	0	ALA	-	expression tag	UNP A0A390C306
D	-1	GLY	-	expression tag	UNP A0A390C306
D	0	ALA	-	expression tag	UNP A0A390C306

- Molecule 2 is THIAMINE DIPHOSPHATE (three-letter code: TPP) (formula: C₁₂H₁₉N₄O₇P₂S) (labeled as "Ligand of Interest" by depositor).



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

- Molecule 3 is GLYCINE (three-letter code: GLY) (formula: $C_2H_5NO_2$).



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

- Molecule 4 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Ca	0	0
			1	1		
4	B	1	Total	Ca	0	0
			1	1		
4	C	1	Total	Ca	0	0
			1	1		
4	D	1	Total	Ca	0	0
			1	1		

- Molecule 5 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total	Na	0	0
			1	1		
5	B	1	Total	Na	0	0
			1	1		
5	C	1	Total	Na	0	0
			1	1		
5	D	1	Total	Na	0	0
			1	1		

- Molecule 6 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	B	1	Total Cl 1 1	0	0

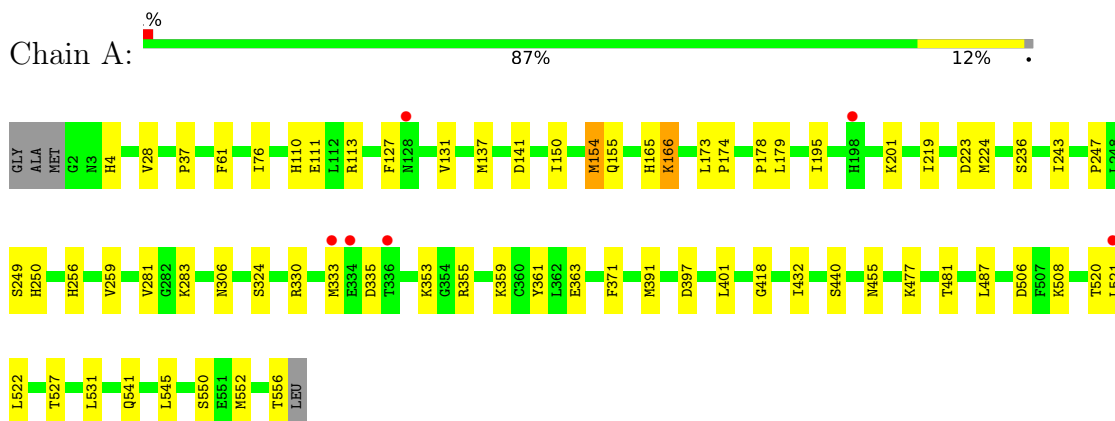
- Molecule 7 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	55	Total O 55 55	0	0
7	B	60	Total O 60 60	0	0
7	C	65	Total O 65 65	0	0
7	D	68	Total O 68 68	0	0

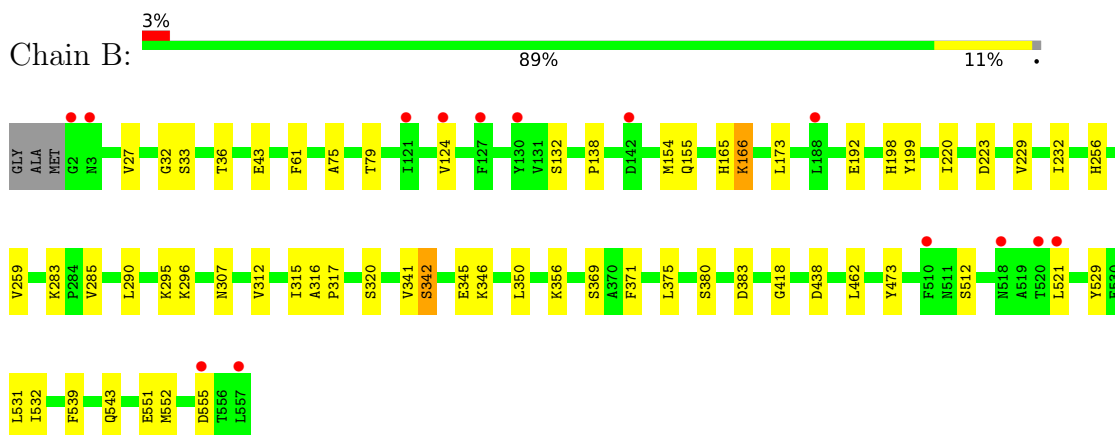
3 Residue-property plots [i](#)

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.

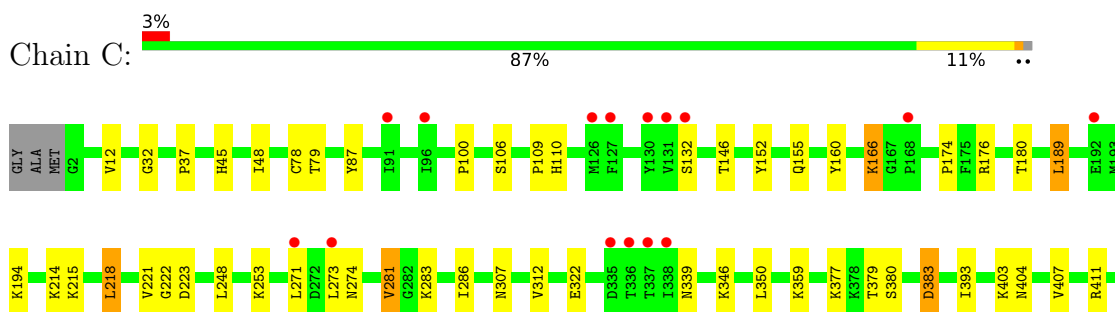
- Molecule 1: 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylate synthase

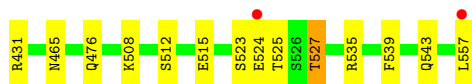


- Molecule 1: 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylate synthase

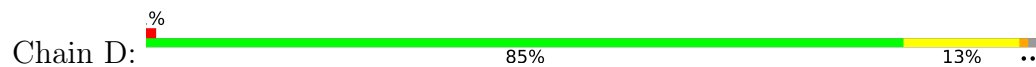


- Molecule 1: 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylate synthase





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



4 Data and refinement statistics i

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	81.44Å 166.49Å 168.03Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.47 – 2.35 47.85 – 2.35	Depositor EDS
% Data completeness (in resolution range)	99.9 (46.47-2.35) 100.0 (47.85-2.35)	Depositor EDS
R_{merge}	0.28	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.29 (at 2.34Å)	Xtrriage
Refinement program	REFMAC 1.0.2, PHENIX 1.19.2-4158	Depositor
R, R_{free}	0.187 , 0.235 0.199 , 0.241	Depositor DCC
R_{free} test set	4855 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å ²)	51.4	Xtrriage
Anisotropy	0.319	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 38.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.002 for -h,l,k	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	18089	wwPDB-VP
Average B, all atoms (Å ²)	56.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.93% 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: CA, CL, NA, TPP

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	0.26	0/4517	0.46	0/6127
1	B	0.26	0/4534	0.47	0/6150
1	C	0.26	0/4523	0.47	0/6133
1	D	0.27	0/4512	0.48	0/6121
All	All	0.26	0/18086	0.47	0/24531

There are no bond length outliers.

There are no bond angle outliers.

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	4419	0	4404	33	0
1	B	4433	0	4406	28	0
1	C	4426	0	4412	41	0
1	D	4415	0	4396	44	0
2	A	26	0	16	2	0
2	B	26	0	16	0	0
2	C	26	0	16	0	0
2	D	26	0	16	0	0
3	A	5	0	2	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	15	0	6	1	0
3	C	15	0	6	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	C	1	0	0	0	0
4	D	1	0	0	0	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
5	C	1	0	0	0	0
5	D	1	0	0	0	0
6	B	1	0	0	0	0
7	A	55	0	0	1	0
7	B	60	0	0	0	0
7	C	65	0	0	2	0
7	D	68	0	0	0	0
All	All	18089	0	17696	133	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.

All (133) 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:D:223:ASP:HB3	1:D:283:LYS:HB2	1.71	0.72
1:C:223:ASP:HB3	1:C:283:LYS:HB2	1.72	0.70
1:C:476:GLN:HE21	1:D:36:THR:HG21	1.57	0.69
1:D:524:GLU:HG3	1:D:525:THR:HG23	1.75	0.68
1:B:27:VAL:HG22	1:B:75:ALA:HB3	1.75	0.68
1:D:98:ARG:NH2	1:D:308:ASP:O	2.28	0.66
1:A:236:SER:HB2	1:A:243:ILE:HD11	1.77	0.65
1:D:388:SER:HB2	1:D:419:ILE:HG21	1.79	0.64
1:C:253:LYS:HB2	1:C:404:ASN:HA	1.80	0.62
1:A:223:ASP:HB3	1:A:283:LYS:HB2	1.83	0.61
1:C:12:VAL:HG21	1:C:37:PRO:HB2	1.81	0.61
1:B:220:ILE:HD13	1:B:290:LEU:HD21	1.82	0.60
1:C:248:LEU:HD23	1:C:407:VAL:HG23	1.83	0.59
1:C:194:LYS:NZ	7:C:705:HOH:O	2.36	0.58
1:B:285:VAL:HG21	1:B:290:LEU:HD23	1.86	0.57
1:C:214:LYS:NZ	7:C:703:HOH:O	2.36	0.57
1:D:110:HIS:HA	1:D:113:ARG:HG2	1.85	0.56
1:A:195:ILE:HD12	1:A:195:ILE:O	2.06	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:223:ASP:HB3	1:B:283:LYS:HB2	1.88	0.56
1:D:33:SER:O	1:D:36:THR:HG23	2.05	0.56
1:D:209:ARG:HD3	1:D:335:ASP:OD2	2.06	0.56
1:A:353:LYS:NZ	7:A:701:HOH:O	2.33	0.55
1:D:256:HIS:HB3	1:D:259:VAL:HG13	1.89	0.55
1:B:295:LYS:HG2	1:B:315:ILE:HG23	1.90	0.54
1:A:37:PRO:HD3	1:A:179:LEU:HB3	1.89	0.54
1:D:4:HIS:CD2	1:D:178:PRO:HD2	2.42	0.53
1:D:231:GLN:HA	1:D:234:THR:HG23	1.90	0.53
1:D:295:LYS:HG2	1:D:315:ILE:HG23	1.90	0.53
1:A:487:LEU:HD21	1:B:43:GLU:HG3	1.91	0.53
1:D:359:LYS:O	1:D:363:GLU:HG3	2.10	0.52
1:A:506:ASP:HB2	1:A:527:THR:HB	1.90	0.52
1:A:155:GLN:HG2	1:D:317:PRO:HD2	1.91	0.51
1:B:521:LEU:O	1:B:529:TYR:OH	2.25	0.51
1:D:507:PHE:O	1:D:508:LYS:HD2	2.11	0.51
1:D:466:ASP:O	1:D:535:ARG:NH1	2.43	0.50
1:B:32:GLY:HA3	1:B:79:THR:HB	1.92	0.50
1:C:286:ILE:HD13	1:C:393:ILE:HG13	1.93	0.50
1:B:473:TYR:HB2	3:B:604:GLY:HA2	1.94	0.50
1:D:147:ILE:HA	1:D:150:ILE:HD12	1.94	0.50
1:D:368:GLU:OE2	1:D:465:ASN:ND2	2.45	0.49
1:C:45:HIS:HD2	1:C:189:LEU:HD12	1.77	0.49
1:D:137:MET:HG3	1:D:173:LEU:HD23	1.94	0.49
1:D:372:VAL:HG11	1:D:395:ASP:HB3	1.94	0.49
1:A:224:MET:HB2	1:A:249:SER:HA	1.95	0.48
1:A:355:ARG:HG2	1:A:401:LEU:HD13	1.95	0.48
1:B:256:HIS:HB3	1:B:259:VAL:HG23	1.95	0.47
1:C:380:SER:O	1:C:383:ASP:HB2	2.14	0.47
1:D:32:GLY:HA3	1:D:79:THR:HB	1.96	0.47
1:B:165:HIS:HE1	1:C:322:GLU:OE1	1.98	0.47
1:C:160:TYR:O	1:C:166:LYS:HA	2.15	0.47
1:A:113:ARG:HH21	1:A:174:PRO:HG3	1.80	0.47
1:A:165:HIS:HE1	1:D:165:HIS:HE1	1.61	0.47
1:D:109:PRO:HD3	1:D:175:PHE:O	2.15	0.47
1:A:359:LYS:O	1:A:363:GLU:HG3	2.15	0.47
1:A:201:LYS:HE2	1:D:199:TYR:HB3	1.97	0.47
1:C:346:LYS:O	1:C:350:LEU:HD13	2.15	0.47
1:A:4:HIS:CD2	1:A:178:PRO:HD2	2.50	0.46
1:A:219:ILE:HB	1:A:243:ILE:HD13	1.97	0.46
1:C:45:HIS:ND1	1:C:48:ILE:HG13	2.31	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:478:GLU:HA	1:D:478:GLU:OE1	2.15	0.46
1:B:342:SER:O	1:B:346:LYS:HG2	2.15	0.46
1:B:371:PHE:CD1	1:B:531:LEU:HD13	2.51	0.46
1:D:70:SER:HB3	1:D:429:HIS:CD2	2.50	0.46
1:A:28:VAL:HB	1:A:76:ILE:HG22	1.98	0.45
1:B:316:ALA:HB2	1:C:152:TYR:HA	1.97	0.45
1:A:165:HIS:HE1	1:D:165:HIS:CE1	2.33	0.45
1:D:223:ASP:OD1	1:D:225:GLN:HG2	2.16	0.45
1:A:256:HIS:HB3	1:A:259:VAL:HG23	1.98	0.45
1:C:465:ASN:HB2	1:C:535:ARG:HG3	1.97	0.45
1:C:110:HIS:CE1	1:C:174:PRO:HG2	2.52	0.45
1:B:539:PHE:O	1:B:543:GLN:HG2	2.16	0.45
2:A:601:TPP:HN42	2:A:601:TPP:C2	2.30	0.45
1:B:229:VAL:HG22	1:B:232:ILE:HD12	1.97	0.45
1:C:508:LYS:HD2	1:C:508:LYS:HA	1.71	0.45
1:A:110:HIS:CE1	1:A:174:PRO:HG2	2.52	0.45
1:B:438:ASP:HA	1:B:462:LEU:HD11	1.98	0.44
1:C:271:LEU:HG	1:C:273:LEU:HD13	1.98	0.44
1:A:361:TYR:CE2	1:A:545:LEU:HB2	2.52	0.44
1:B:317:PRO:HD2	1:C:155:GLN:HG2	1.99	0.44
1:C:525:THR:O	1:C:527:THR:HG22	2.17	0.44
1:A:150:ILE:O	1:A:154:MET:HB2	2.18	0.44
1:C:32:GLY:HA3	1:C:79:THR:HB	2.00	0.43
1:D:549:LEU:HD22	1:D:552:MET:HE3	1.99	0.43
1:D:108[B]:ARG:HD3	1:D:108[B]:ARG:H	1.82	0.43
1:B:33:SER:O	1:B:36:THR:OG1	2.28	0.43
1:D:266:LEU:HD13	1:D:271:LEU:HD22	2.00	0.43
1:B:341:VAL:HG12	1:B:345:GLU:OE2	2.19	0.43
1:C:539:PHE:O	1:C:543:GLN:HG2	2.19	0.43
1:C:215:LYS:HD3	1:C:339:ASN:O	2.18	0.43
1:C:377:LYS:HD3	1:C:377:LYS:HA	1.65	0.43
1:B:61:PHE:CG	1:B:418:GLY:HA3	2.54	0.43
1:B:166:LYS:HB2	1:B:166:LYS:HE2	1.85	0.43
1:D:388:SER:HB3	1:D:436:ILE:HA	2.01	0.43
1:D:539:PHE:O	1:D:543:GLN:HG2	2.18	0.43
1:D:27:VAL:HG22	1:D:75:ALA:HB3	2.01	0.43
1:D:256:HIS:O	1:D:259:VAL:HG22	2.19	0.43
1:A:306:ASN:HB2	1:A:324:SER:HA	1.99	0.42
1:C:476:GLN:OE1	1:C:476:GLN:N	2.50	0.42
1:C:512:SER:HB3	1:C:515:GLU:OE2	2.19	0.42
1:D:303:LEU:HD11	1:D:305:GLN:HE21	1.85	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:411:ARG:HA	1:C:411:ARG:HD2	1.65	0.42
1:A:333:MET:O	1:A:335:ASP:N	2.50	0.42
1:C:100:PRO:HD3	1:C:166:LYS:HD3	2.02	0.42
1:C:431:ARG:HG3	1:C:431:ARG:HH11	1.84	0.42
1:C:166:LYS:HB3	1:C:166:LYS:HE3	1.79	0.41
1:D:247:PRO:HD3	1:D:252:ARG:NH2	2.35	0.41
1:D:390:SER:O	1:D:393:ILE:HG22	2.19	0.41
1:B:312:VAL:HB	1:B:317:PRO:HD3	2.02	0.41
1:D:224:MET:HB2	1:D:249:SER:HA	2.02	0.41
1:D:549:LEU:HD22	1:D:552:MET:CE	2.50	0.41
1:A:111:GLU:HB2	1:C:146:THR:HA	2.02	0.41
1:B:380:SER:O	1:B:383:ASP:HB2	2.21	0.41
1:C:109:PRO:HG3	1:C:176:ARG:HA	2.02	0.41
1:B:138:PRO:HB3	1:D:110:HIS:HB2	2.03	0.41
1:C:221:VAL:HG13	1:C:281:VAL:HG22	2.01	0.41
1:D:8:LEU:O	1:D:12:VAL:HG22	2.21	0.41
1:D:108[B]:ARG:HH21	1:D:113:ARG:HA	1.85	0.41
1:A:371:PHE:CD1	1:A:531:LEU:HD13	2.56	0.41
1:B:320:SER:OG	1:C:155:GLN:NE2	2.54	0.41
1:C:222:GLY:HA3	1:C:283:LYS:O	2.20	0.41
1:A:61:PHE:CD2	1:A:418:GLY:HA3	2.56	0.40
1:A:111:GLU:HB3	1:C:146:THR:HG22	2.03	0.40
1:A:127:PHE:O	1:A:131:VAL:HG22	2.21	0.40
1:A:247:PRO:HG3	1:A:397:ASP:HA	2.02	0.40
1:A:137:MET:HG3	1:A:173:LEU:HD23	2.03	0.40
1:A:166:LYS:HB3	1:A:166:LYS:HE2	1.62	0.40
1:A:391:MET:HB2	2:A:601:TPP:O2B	2.21	0.40
1:B:155:GLN:HG2	1:C:312:VAL:HG11	2.03	0.40
1:B:350:LEU:O	1:B:552:MET:HE1	2.21	0.40
1:C:379:THR:O	1:C:403:LYS:NZ	2.44	0.40
1:C:78:CYS:HB3	1:C:87:TYR:OH	2.20	0.40
1:C:218:LEU:HD12	1:C:218:LEU:HA	1.92	0.40
1:D:146:THR:HG22	1:D:147:ILE:HD13	2.03	0.40

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	553/559 (99%)	537 (97%)	16 (3%)	0	100	100
1	B	555/559 (99%)	537 (97%)	18 (3%)	0	100	100
1	C	554/559 (99%)	539 (97%)	15 (3%)	0	100	100
1	D	552/559 (99%)	535 (97%)	17 (3%)	0	100	100
All	All	2214/2236 (99%)	2148 (97%)	66 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	488/493 (99%)	469 (96%)	19 (4%)	32	40
1	B	490/493 (99%)	472 (96%)	18 (4%)	34	42
1	C	488/493 (99%)	473 (97%)	15 (3%)	40	48
1	D	487/493 (99%)	473 (97%)	14 (3%)	42	52
All	All	1953/1972 (99%)	1887 (97%)	66 (3%)	38	46

All (66) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	141	ASP
1	A	154	MET

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Mol	Chain	Res	Type
1	A	166	LYS
1	A	250	HIS
1	A	281	VAL
1	A	330	ARG
1	A	432	ILE
1	A	440	SER
1	A	455	ASN
1	A	477	LYS
1	A	481	THR
1	A	508	LYS
1	A	520	THR
1	A	521	LEU
1	A	522	LEU
1	A	541	GLN
1	A	550	SER
1	A	552	MET
1	A	556	THR
1	B	124	VAL
1	B	132	SER
1	B	154	MET
1	B	166	LYS
1	B	173	LEU
1	B	192	GLU
1	B	198	HIS
1	B	199	TYR
1	B	296	LYS
1	B	307	ASN
1	B	342	SER
1	B	356	LYS
1	B	369	SER
1	B	375	LEU
1	B	512	SER
1	B	532	ILE
1	B	551	GLU
1	B	555	ASP
1	C	106	SER
1	C	132	SER
1	C	166	LYS
1	C	180	THR
1	C	189	LEU
1	C	218	LEU
1	C	274	ASN

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Mol	Chain	Res	Type
1	C	281	VAL
1	C	307	ASN
1	C	359	LYS
1	C	383	ASP
1	C	523	SER
1	C	524	GLU
1	C	527	THR
1	C	557	LEU
1	D	108[A]	ARG
1	D	108[B]	ARG
1	D	124	VAL
1	D	132	SER
1	D	166	LYS
1	D	198	HIS
1	D	234	THR
1	D	298	ASP
1	D	335	ASP
1	D	336	THR
1	D	375	LEU
1	D	380	SER
1	D	394	ARG
1	D	522	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	165	HIS
1	A	305	GLN
1	A	307	ASN
1	B	165	HIS
1	B	455	ASN
1	C	165	HIS

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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 20 ligands modelled in this entry, 9 are monoatomic - leaving 11 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	GLY	C	604	-	4,4,4	1.09	1 (25%)	3,4,4	1.63	1 (33%)
2	TPP	C	601	4	22,27,27	0.58	0	29,40,40	0.88	1 (3%)
3	GLY	B	603	-	4,4,4	1.13	1 (25%)	3,4,4	1.62	1 (33%)
3	GLY	C	602	-	4,4,4	1.10	1 (25%)	3,4,4	1.65	1 (33%)
3	GLY	C	603	-	4,4,4	1.10	1 (25%)	3,4,4	1.70	2 (66%)
3	GLY	B	604	-	4,4,4	1.10	1 (25%)	3,4,4	1.71	1 (33%)
3	GLY	A	602	-	4,4,4	1.09	1 (25%)	3,4,4	1.66	1 (33%)
2	TPP	D	601	4	22,27,27	0.56	0	29,40,40	0.71	2 (6%)
2	TPP	A	601	4	22,27,27	0.66	0	29,40,40	0.90	3 (10%)
3	GLY	B	602	-	4,4,4	1.09	1 (25%)	3,4,4	1.69	1 (33%)
2	TPP	B	601	4	22,27,27	0.57	0	29,40,40	0.88	3 (10%)

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	GLY	C	604	-	-	0/2/2/2	-
2	TPP	C	601	4	-	2/16/17/17	0/2/2/2
3	GLY	B	603	-	-	0/2/2/2	-
3	GLY	C	602	-	-	1/2/2/2	-
3	GLY	C	603	-	-	2/2/2/2	-
3	GLY	B	604	-	-	0/2/2/2	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	GLY	A	602	-	-	0/2/2/2	-
2	TPP	D	601	4	-	0/16/17/17	0/2/2/2
2	TPP	A	601	4	-	5/16/17/17	0/2/2/2
3	GLY	B	602	-	-	0/2/2/2	-
2	TPP	B	601	4	-	0/16/17/17	0/2/2/2

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	603	GLY	OXT-C	-2.11	1.23	1.30
3	B	604	GLY	OXT-C	-2.08	1.23	1.30
3	C	603	GLY	OXT-C	-2.07	1.23	1.30
3	C	602	GLY	OXT-C	-2.05	1.23	1.30
3	A	602	GLY	OXT-C	-2.05	1.23	1.30
3	C	604	GLY	OXT-C	-2.05	1.23	1.30
3	B	602	GLY	OXT-C	-2.04	1.23	1.30

All (17) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	604	GLY	OXT-C-O	-2.22	117.77	123.30
3	C	604	GLY	OXT-C-O	-2.17	117.90	123.30
3	A	602	GLY	OXT-C-O	-2.13	117.99	123.30
3	B	602	GLY	OXT-C-O	-2.11	118.03	123.30
3	C	603	GLY	OXT-C-O	-2.10	118.06	123.30
3	B	603	GLY	OXT-C-O	-2.09	118.09	123.30
2	A	601	TPP	C5-C4-N3	2.08	111.73	107.57
2	D	601	TPP	C5-C4-N3	2.08	111.73	107.57
2	D	601	TPP	PA-O3A-PB	2.08	139.95	132.83
2	A	601	TPP	O3B-PB-O3A	2.08	111.59	104.64
3	C	602	GLY	OXT-C-O	-2.06	118.17	123.30
2	B	601	TPP	PA-O3A-PB	2.05	139.88	132.83
2	B	601	TPP	O2B-PB-O3A	2.04	111.48	104.64
2	B	601	TPP	C5-C4-N3	2.03	111.64	107.57
2	A	601	TPP	PA-O3A-PB	2.03	139.79	132.83
2	C	601	TPP	O2B-PB-O3A	2.02	111.39	104.64
3	C	603	GLY	OXT-C-CA	2.01	121.44	113.45

There are no chirality outliers.

All (10) torsion outliers are listed below:

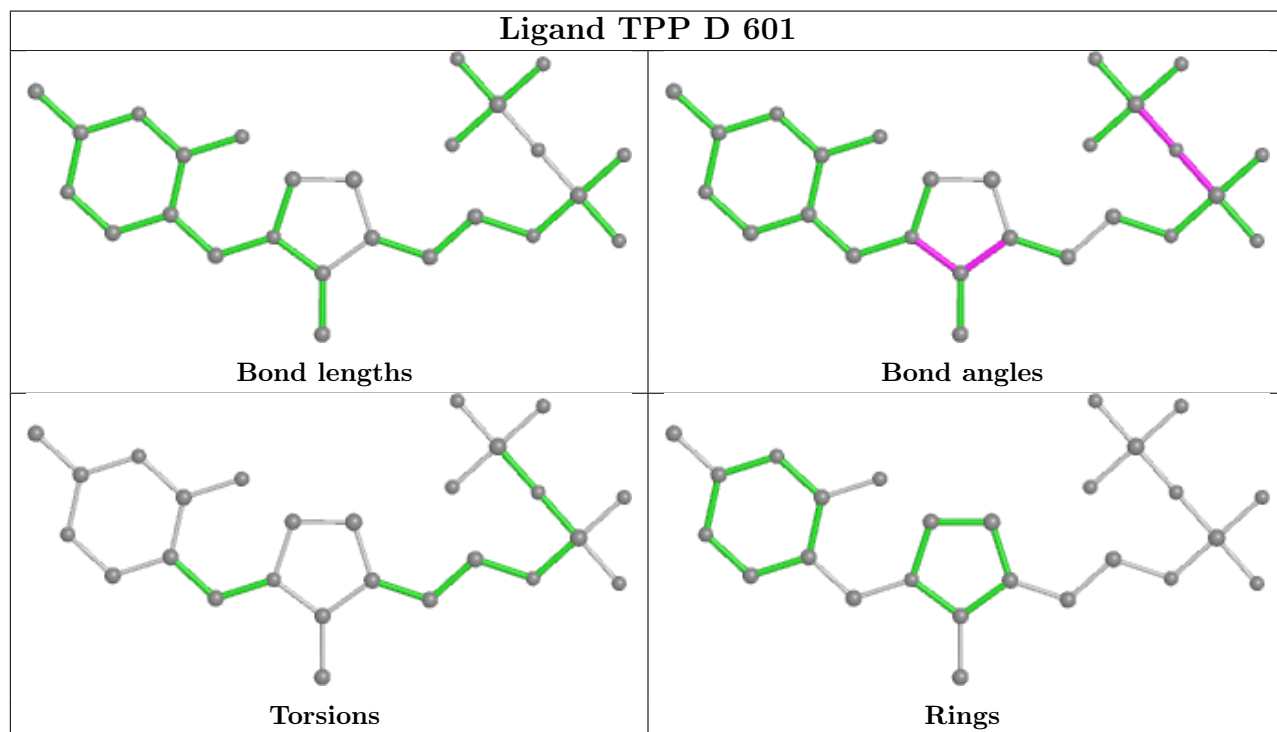
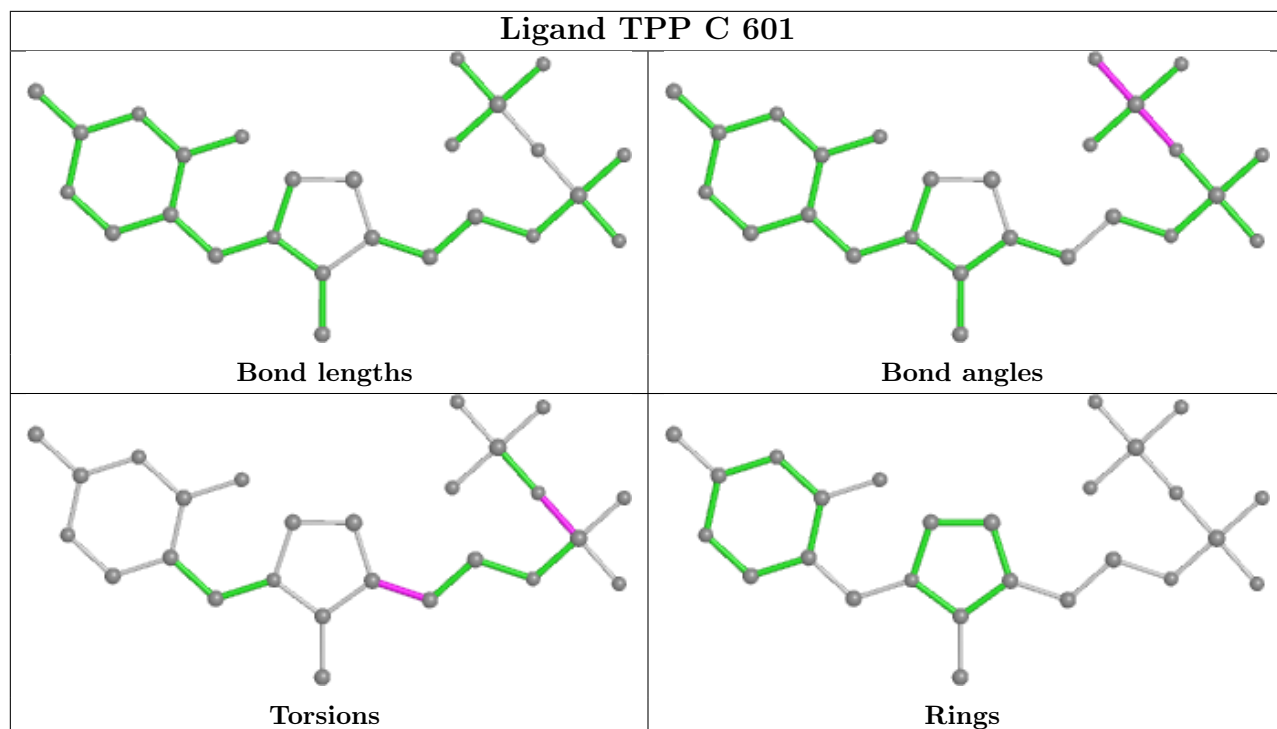
Mol	Chain	Res	Type	Atoms
2	A	601	TPP	C4'-C5'-C7'-N3
2	A	601	TPP	PB-O3A-PA-O7
2	C	601	TPP	C4-C5-C6-C7
2	C	601	TPP	PB-O3A-PA-O7
3	C	603	GLY	O-C-CA-N
3	C	603	GLY	OXT-C-CA-N
2	A	601	TPP	C7-O7-PA-O3A
3	C	602	GLY	OXT-C-CA-N
2	A	601	TPP	C7-O7-PA-O1A
2	A	601	TPP	C7-O7-PA-O2A

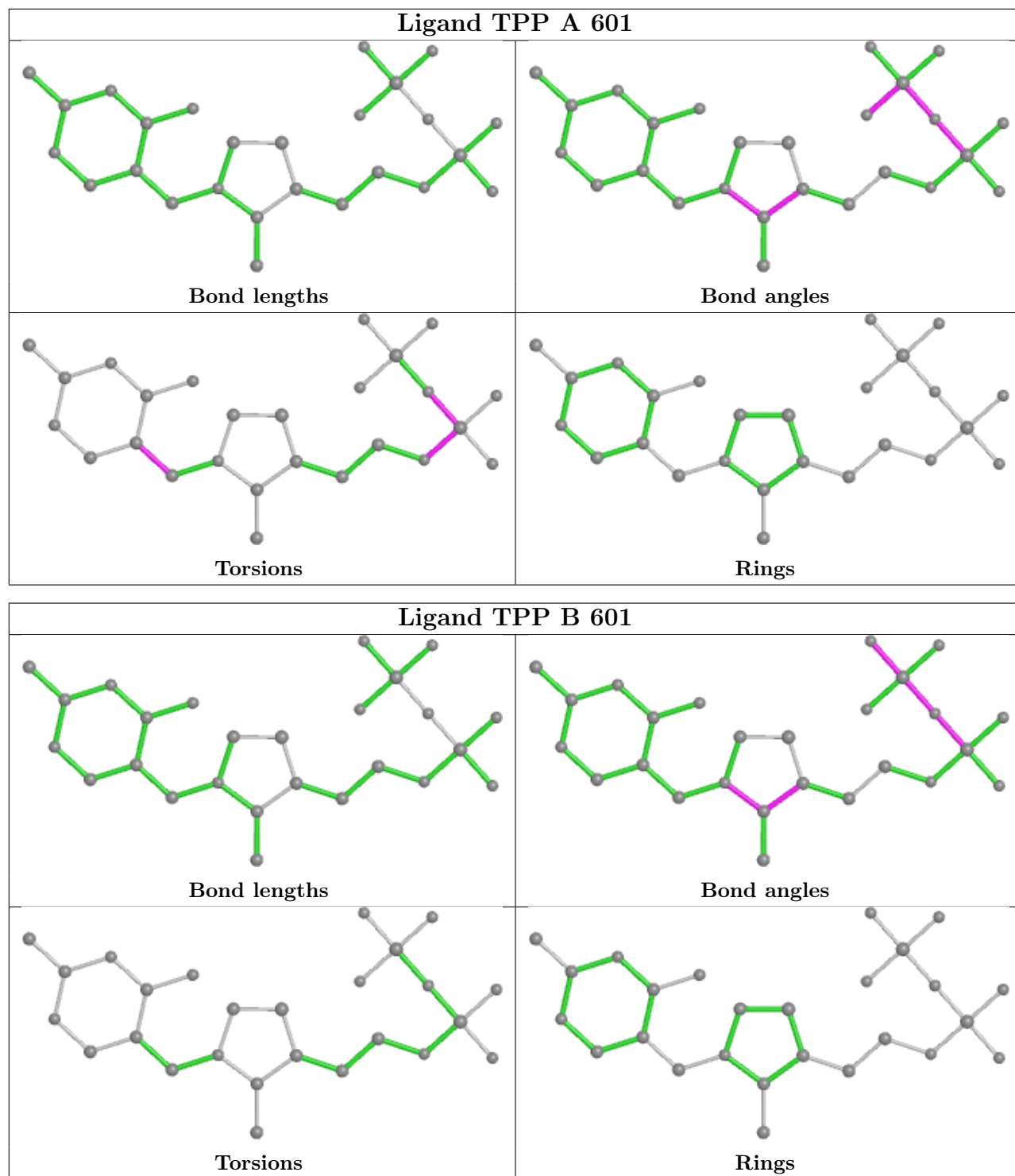
There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	604	GLY	1	0
2	A	601	TPP	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

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	555/559 (99%)	-0.11	6 (1%) 80 87	42, 54, 74, 98	0
1	B	556/559 (99%)	0.11	14 (2%) 57 67	40, 53, 73, 100	0
1	C	556/559 (99%)	0.02	17 (3%) 49 61	39, 55, 75, 104	0
1	D	553/559 (98%)	-0.00	5 (0%) 84 90	39, 55, 75, 95	0
All	All	2220/2236 (99%)	0.00	42 (1%) 66 76	39, 54, 74, 104	0

All (42) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	521	LEU	4.8
1	C	337	THR	4.3
1	B	557	LEU	3.9
1	A	334	GLU	3.6
1	D	521	LEU	3.6
1	C	338	ILE	3.4
1	D	522	LEU	3.2
1	A	521	LEU	3.2
1	C	557	LEU	3.2
1	B	3	ASN	3.1
1	B	518	ASN	3.0
1	C	132	SER	2.9
1	B	2	GLY	2.7
1	C	273	LEU	2.7
1	C	271	LEU	2.6
1	C	91	ILE	2.6
1	C	131	VAL	2.5
1	C	335	ASP	2.5
1	C	96	ILE	2.5
1	B	188	LEU	2.5
1	B	130	TYR	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	333	MET	2.4
1	B	142	ASP	2.4
1	B	520	THR	2.4
1	B	121	ILE	2.3
1	A	128	ASN	2.3
1	D	545	LEU	2.3
1	B	124	VAL	2.3
1	B	510	PHE	2.3
1	B	127	PHE	2.1
1	C	336	THR	2.1
1	B	555	ASP	2.1
1	A	198	HIS	2.1
1	C	168	PRO	2.1
1	C	524	GLU	2.1
1	D	349	CYS	2.1
1	C	127	PHE	2.1
1	A	336	THR	2.1
1	C	192	GLU	2.0
1	C	126	MET	2.0
1	C	130	TYR	2.0
1	D	209	ARG	2.0

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 monosaccharides in this entry.

6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	GLY	B	604	5/5	0.77	0.21	59,63,72,73	0
3	GLY	C	604	5/5	0.80	0.36	60,62,75,75	0

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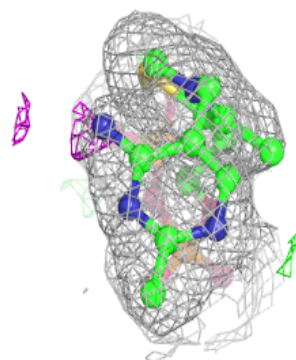
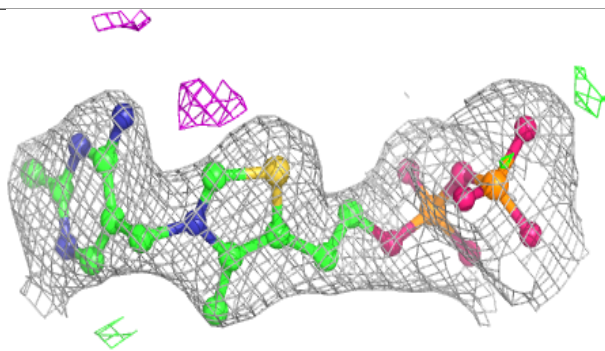
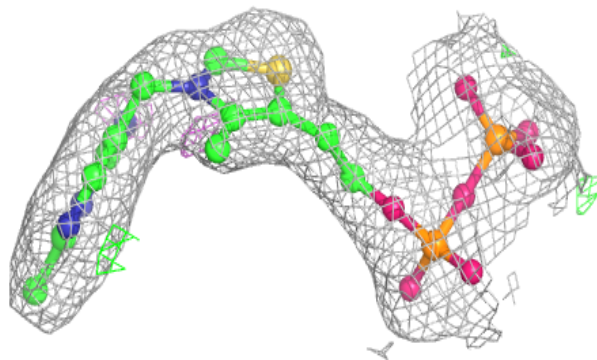
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
3	GLY	C	603	5/5	0.86	0.26	60,60,60,70	0
3	GLY	A	602	5/5	0.86	0.22	52,52,64,68	0
5	NA	D	603	1/1	0.90	0.04	57,57,57,57	0
5	NA	B	607	1/1	0.92	0.09	53,53,53,53	0
3	GLY	B	603	5/5	0.93	0.26	71,72,77,78	0
5	NA	C	606	1/1	0.94	0.05	58,58,58,58	0
4	CA	D	602	1/1	0.95	0.14	53,53,53,53	0
3	GLY	C	602	5/5	0.96	0.10	61,61,70,73	0
4	CA	A	603	1/1	0.96	0.16	49,49,49,49	0
3	GLY	B	602	5/5	0.96	0.10	51,53,64,71	0
2	TPP	D	601	26/26	0.97	0.12	46,52,56,57	0
2	TPP	A	601	26/26	0.97	0.14	43,50,52,53	0
5	NA	A	604	1/1	0.97	0.08	60,60,60,60	0
2	TPP	B	601	26/26	0.98	0.09	44,49,52,54	0
4	CA	B	605	1/1	0.98	0.11	50,50,50,50	0
4	CA	C	605	1/1	0.98	0.17	50,50,50,50	0
2	TPP	C	601	26/26	0.98	0.11	38,50,55,56	0
6	CL	B	606	1/1	0.98	0.04	55,55,55,55	0

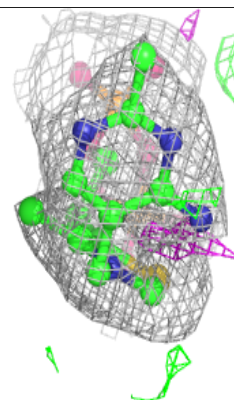
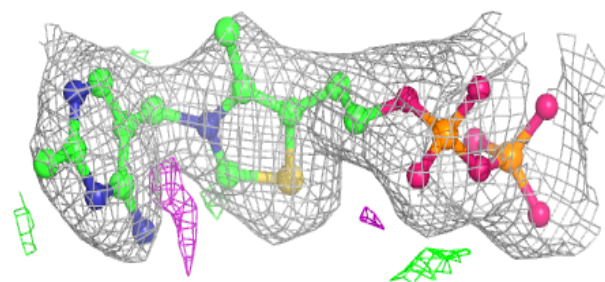
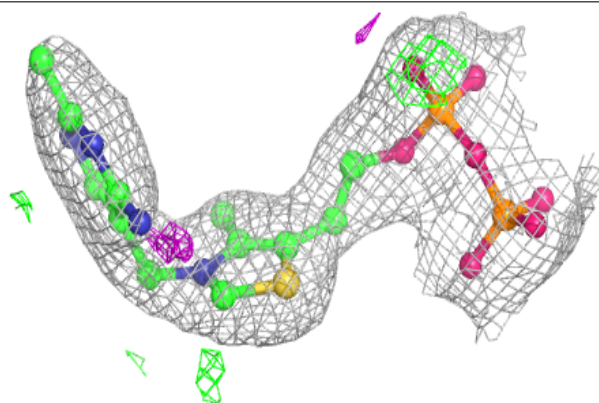
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around TPP 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)

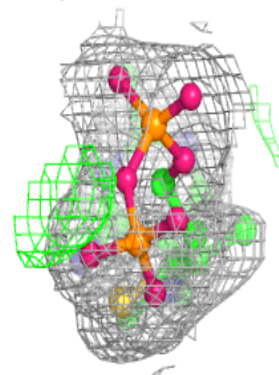
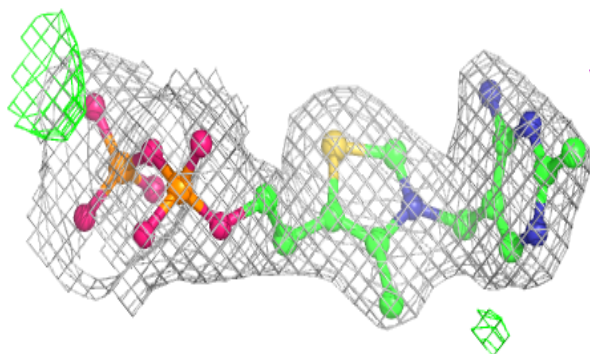
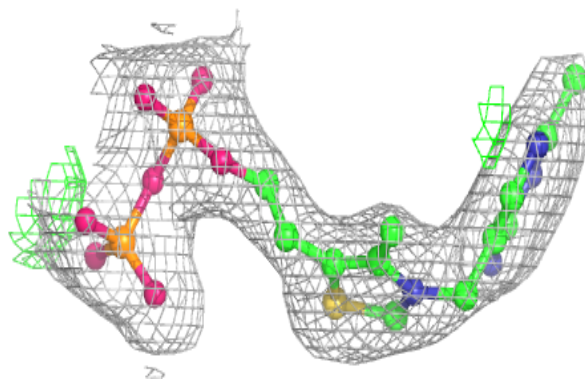
**Electron density around TPP A 601:**

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

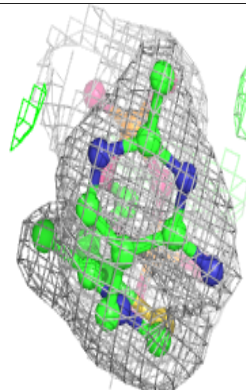
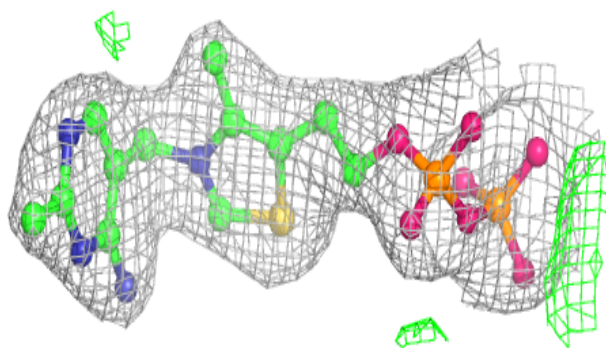
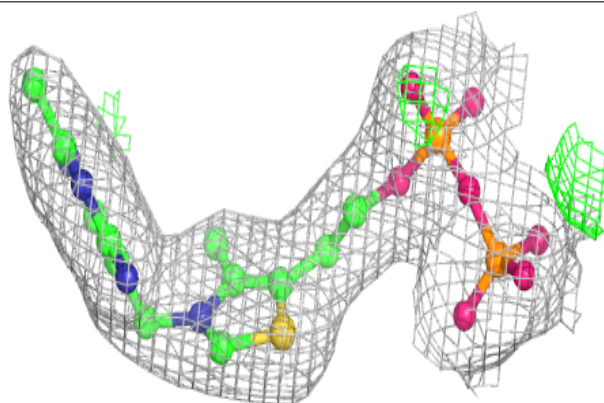


Electron density around TPP B 601:

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

**Electron density around 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.