



Full wwPDB X-ray Structure Validation Report ⓘ

Sep 19, 2023 – 11:13 AM EDT

PDB ID : 5F4S
Title : Tagatose-1,6-bisphosphate aldolase from *Streptococcus pyogenes* in complex with FBP
Authors : LowKam, C.
Deposited on : 2015-12-03
Resolution : 1.72 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 : 2.35.1
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) : 2.35.1

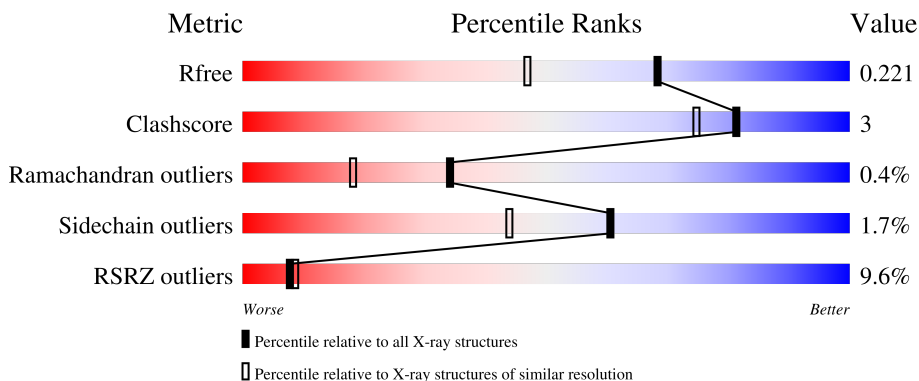
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.72 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	5722 (1.74-1.70)
Clashscore	141614	6152 (1.74-1.70)
Ramachandran outliers	138981	6051 (1.74-1.70)
Sidechain outliers	138945	6051 (1.74-1.70)
RSRZ outliers	127900	5629 (1.74-1.70)

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	327	 5% 95% 6% ..
1	B	327	 8% 94% 6% .
1	C	327	 14% 92% 6% ..
1	D	327	 11% 91% 8%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	P6F	A	3001[B]	-	-	X	-
2	P6F	A	3001[C]	-	X	-	-
4	CL	A	3003[D]	-	-	X	-

2 Entry composition [i](#)

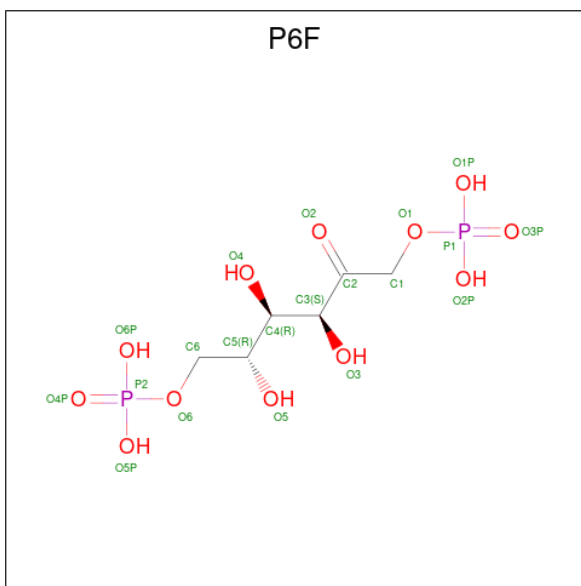
There are 6 unique types of molecules in this entry. The entry contains 21911 atoms, of which 10186 are hydrogens and 0 are deuteriums.

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 Tagatose 1,6-diphosphate aldolase 2.

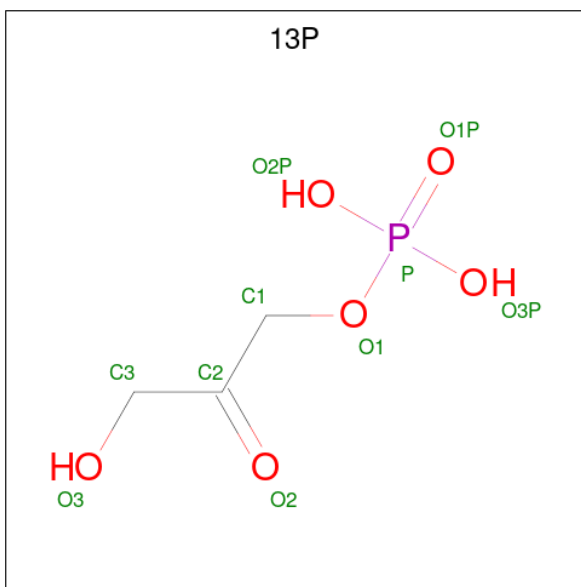
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	H	N	O				S
1	A	324	Total	C	H	N	O	S	0	2	0
			5090	1623	2534	421	504	8			
1	B	325	Total	C	H	N	O	S	0	7	0
			5165	1644	2574	429	509	9			
1	C	323	Total	C	H	N	O	S	0	1	0
			5073	1617	2525	420	503	8			
1	D	326	Total	C	H	N	O	S	0	0	0
			5113	1629	2548	422	505	9			

- Molecule 2 is 1,6-di-O-phosphono-D-fructose (three-letter code: P6F) (formula: C₆H₁₄O₁₂P₂).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	O	P		
2	A	1	Total	C	O	P	0	1
			57	18	33	6		

- Molecule 3 is 1,3-DIHYDROXYACETONEPHOSPHATE (three-letter code: 13P) (formula: C₃H₇O₆P).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O P 9 3 5 1	0	1
3	B	1	Total C H O P 14 3 5 5 1	0	0

- Molecule 4 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total Cl 1 1	0	1

- Molecule 5 is CALCIUM ION (three-letter code: CA) (formula: Ca).

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

- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	442	Total O 442 442	0	2

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	B	418	Total 418	O 418	0	0
6	C	253	Total 253	O 253	0	0
6	D	271	Total 271	O 271	0	0

3 Residue-property plots [i](#)

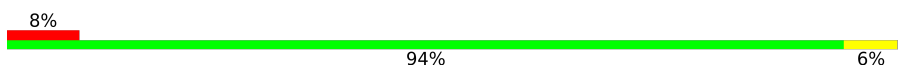
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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.

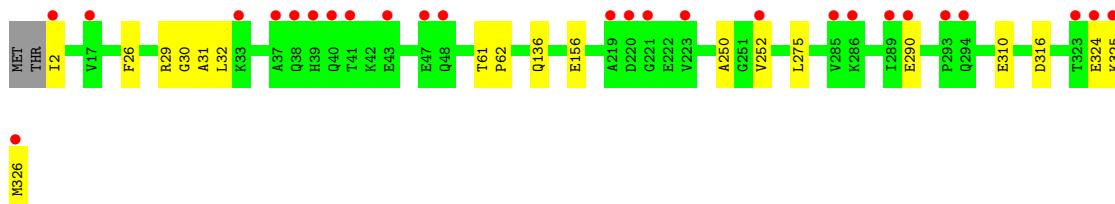
- Molecule 1: Tagatose 1,6-diphosphate aldolase 2

Chain A: 

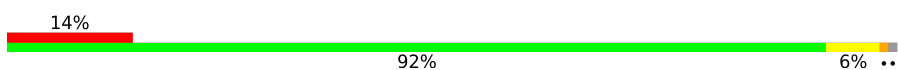


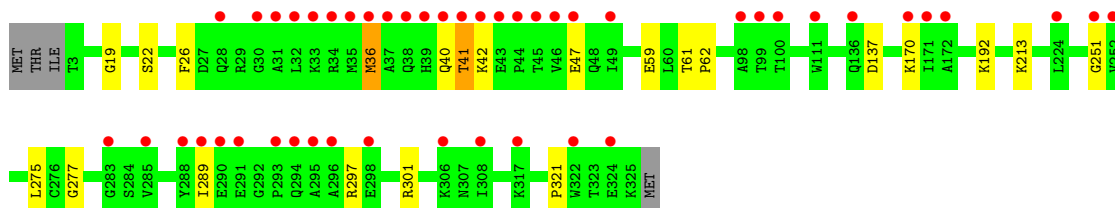
- Molecule 1: Tagatose 1,6-diphosphate aldolase 2

Chain B: 



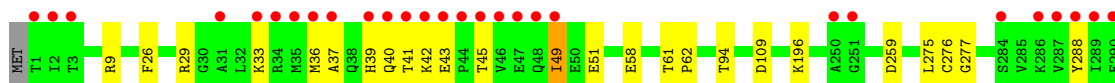
- Molecule 1: Tagatose 1,6-diphosphate aldolase 2

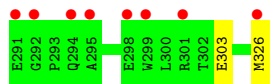
Chain C: 



- Molecule 1: Tagatose 1,6-diphosphate aldolase 2

Chain D: 





4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	64.01Å 109.14Å 238.34Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.10 – 1.72 50.10 – 1.72	Depositor EDS
% Data completeness (in resolution range)	64.3 (50.10-1.72) 63.9 (50.10-1.72)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.23 (at 1.72Å)	Xtrriage
Refinement program	PHENIX (1.10.1_2155: ???)	Depositor
R, R_{free}	0.180 , 0.219 0.182 , 0.221	Depositor DCC
R_{free} test set	2000 reflections (1.59%)	wwPDB-VP
Wilson B-factor (Å ²)	18.7	Xtrriage
Anisotropy	0.774	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 50.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	21911	wwPDB-VP
Average B, all atoms (Å ²)	44.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 45.26 % 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 1.3549e-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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: CL, P6F, CA, 13P

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	0.31	0/2609	0.50	0/3523
1	B	0.31	0/2647	0.51	0/3572
1	C	0.29	0/2594	0.46	0/3502
1	D	0.28	0/2611	0.48	0/3525
All	All	0.30	0/10461	0.49	0/14122

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

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

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	D	42	LYS	Peptide

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	2556	2534	2526	16	0
1	B	2591	2574	2564	10	0
1	C	2548	2525	2524	12	0
1	D	2565	2548	2550	14	0
2	A	57	0	26	8	0
3	A	9	0	5	1	0
3	B	9	5	5	0	0
4	A	1	0	0	2	0
5	A	2	0	0	0	0
5	B	2	0	0	0	0
5	C	1	0	0	0	0
6	A	442	0	0	6	1
6	B	418	0	0	4	1
6	C	253	0	0	3	1
6	D	271	0	0	6	1
All	All	11725	10186	10200	53	2

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 3.

All (53) 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:A:28:GLN:NE2	2:A:3001[B]:P6F:O5	2.02	0.91
1:A:28:GLN:CD	2:A:3001[B]:P6F:O5	2.08	0.91
1:A:2:ILE:N	6:A:3102:HOH:O	2.09	0.85
1:D:9:ARG:NH2	1:D:326:MET:SD	2.51	0.83
1:A:28:GLN:HG3	2:A:3001[B]:P6F:O5	1.82	0.78
1:A:28:GLN:CG	2:A:3001[B]:P6F:O5	2.33	0.77
1:A:216:GLU:OE1	6:A:3101:HOH:O	2.04	0.75
1:C:40:GLN:NE2	1:C:42:LYS:O	2.21	0.74
1:C:137:ASP:OD2	6:C:501:HOH:O	2.05	0.73
1:D:109:ASP:OD2	6:D:401:HOH:O	2.07	0.71
1:B:156:GLU:OE2	6:B:501:HOH:O	2.11	0.69
1:B:29[A]:ARG:O	6:B:502:HOH:O	2.11	0.68
1:D:259:ASP:OD2	6:D:403:HOH:O	2.12	0.68
1:D:58:GLU:OE1	6:D:402:HOH:O	2.10	0.68
1:B:29[A]:ARG:O	1:B:31:ALA:N	2.28	0.66
1:B:310:GLU:OE1	6:B:503:HOH:O	2.13	0.66
1:D:36:MET:SD	6:D:655:HOH:O	2.53	0.65
1:D:303:GLU:OE2	6:D:404:HOH:O	2.14	0.64
1:A:30:GLY:N	4:A:3003[D]:CL:CL	2.68	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:170:LYS:NZ	6:C:506:HOH:O	2.32	0.62
1:A:324:GLU:OE1	6:A:3103:HOH:O	2.16	0.60
1:A:174:ASN:OD1	6:A:3104:HOH:O	2.17	0.59
1:B:29[B]:ARG:O	1:B:32:LEU:N	2.35	0.58
1:C:213:LYS:NZ	1:C:251:GLY:O	2.29	0.58
1:A:28:GLN:HG3	2:A:3001[B]:P6F:HO5	1.69	0.58
1:B:324:GLU:N	1:B:325:LYS:HA	2.22	0.55
1:C:47:GLU:OE1	1:C:47:GLU:N	2.39	0.55
2:A:3001[B]:P6F:H6	6:A:3272:HOH:O	2.07	0.54
1:A:94:THR:OG1	4:A:3003[D]:CL:CL	2.60	0.54
1:A:136:GLN:NE2	6:A:3113:HOH:O	2.42	0.52
1:D:196:LYS:NZ	6:D:406:HOH:O	2.32	0.52
1:C:61:THR:N	1:C:62:PRO:CD	2.74	0.51
1:A:28:GLN:NE2	2:A:3001[B]:P6F:HO5	2.09	0.50
1:D:61:THR:N	1:D:62:PRO:CD	2.75	0.50
1:A:61:THR:N	1:A:62:PRO:CD	2.76	0.49
1:A:27:ASP:OD1	2:A:3001[C]:P6F:O3	2.31	0.48
1:A:275:LEU:O	3:A:3002[D]:13P:H12	2.14	0.47
1:C:59:GLU:OE2	1:C:297:ARG:NH1	2.47	0.47
1:B:61:THR:N	1:B:62:PRO:CD	2.78	0.47
1:C:41:THR:O	1:C:42:LYS:HB2	2.15	0.47
1:C:192:LYS:NZ	6:C:520:HOH:O	2.48	0.46
1:D:43:GLU:O	1:D:43:GLU:HG3	2.16	0.45
1:D:40:GLN:HA	1:D:41:THR:C	2.38	0.44
1:D:51:GLU:OE1	1:D:288:TYR:OH	2.22	0.43
1:C:297:ARG:O	1:C:301:ARG:HG3	2.19	0.43
1:B:290:GLU:OE1	1:B:290:GLU:N	2.52	0.42
1:D:29:ARG:CZ	1:D:94:THR:HG23	2.50	0.42
1:D:33:LYS:HG2	1:D:49:ILE:HD11	2.02	0.42
1:C:36:MET:HG2	1:C:289:ILE:HD11	2.00	0.42
1:D:37:ALA:O	1:D:40:GLN:NE2	2.53	0.42
1:B:326:MET:HE3	6:B:573:HOH:O	2.20	0.41
1:C:19:GLY:O	1:C:321:PRO:HA	2.21	0.41
1:B:2:ILE:CG2	1:B:325:LYS:HB3	2.52	0.40

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

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
6:C:723:HOH:O	6:D:416:HOH:O[2_564]	2.06	0.14
6:A:3461:HOH:O	6:B:871:HOH:O[3_655]	2.15	0.05

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	324/327 (99%)	313 (97%)	11 (3%)	0	100	100
1	B	330/327 (101%)	308 (93%)	16 (5%)	6 (2%)	8	1
1	C	322/327 (98%)	306 (95%)	15 (5%)	1 (0%)	41	24
1	D	324/327 (99%)	308 (95%)	15 (5%)	1 (0%)	41	24
All	All	1300/1308 (99%)	1235 (95%)	57 (4%)	8 (1%)	34	10

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	250[A]	ALA
1	B	250[B]	ALA
1	B	30[A]	GLY
1	B	30[B]	GLY
1	D	277	GLY
1	C	277	GLY
1	B	252[A]	VAL
1	B	252[B]	VAL

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	273/274 (100%)	269 (98%)	4 (2%)	65	49
1	B	276/274 (101%)	272 (99%)	4 (1%)	67	52

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	C	271/274 (99%)	266 (98%)	5 (2%)	59	41
1	D	273/274 (100%)	267 (98%)	6 (2%)	52	33
All	All	1093/1096 (100%)	1074 (98%)	19 (2%)	60	44

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	26	PHE
1	A	136	GLN
1	A	174	ASN
1	A	316	ASP
1	B	26	PHE
1	B	136	GLN
1	B	275	LEU
1	B	316	ASP
1	C	22	SER
1	C	26	PHE
1	C	36	MET
1	C	41	THR
1	C	275	LEU
1	D	26	PHE
1	D	39	HIS
1	D	45	THR
1	D	49	ILE
1	D	275	LEU
1	D	276	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	28	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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 11 ligands modelled in this entry, 6 are monoatomic - leaving 5 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	P6F	A	3001[C]	-	18,18,19	2.26	8 (44%)	24,26,28	2.51	7 (29%)
3	13P	B	401	1	8,8,9	0.86	0	10,10,12	1.70	4 (40%)
2	P6F	A	3001[A]	1	18,18,19	2.61	5 (27%)	24,26,28	1.29	2 (8%)
2	P6F	A	3001[B]	-	18,18,19	3.58	9 (50%)	24,26,28	2.37	5 (20%)
3	13P	A	3002[D]	1	8,8,9	0.55	0	10,10,12	0.67	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	P6F	A	3001[C]	-	-	12/21/21/24	-
3	13P	B	401	1	-	1/6/6/8	-
2	P6F	A	3001[A]	1	-	9/21/21/24	-
2	P6F	A	3001[B]	-	-	3/21/21/24	-
3	13P	A	3002[D]	1	-	1/6/6/8	-

All (22) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	3001[B]	P6F	C6-C5	-10.73	1.36	1.51
2	A	3001[A]	P6F	P2-O6	7.01	1.82	1.60
2	A	3001[A]	P6F	P1-O1	6.70	1.81	1.60
2	A	3001[C]	P6F	O3-C3	-5.50	1.31	1.43

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	3001[B]	P6F	O5-C5	5.30	1.54	1.43
2	A	3001[B]	P6F	O4-C4	-4.69	1.31	1.43
2	A	3001[B]	P6F	O3-C3	-4.53	1.33	1.43
2	A	3001[C]	P6F	O4-C4	-3.31	1.35	1.43
2	A	3001[C]	P6F	C5-C4	3.22	1.59	1.53
2	A	3001[A]	P6F	C6-C5	3.16	1.56	1.51
2	A	3001[B]	P6F	P1-O1P	-2.95	1.43	1.54
2	A	3001[C]	P6F	P1-O1P	-2.95	1.43	1.54
2	A	3001[B]	P6F	P1-O2P	-2.83	1.44	1.54
2	A	3001[C]	P6F	P1-O2P	-2.83	1.44	1.54
2	A	3001[B]	P6F	P1-O3P	-2.81	1.41	1.50
2	A	3001[C]	P6F	P1-O3P	-2.81	1.41	1.50
2	A	3001[B]	P6F	C3-C4	2.45	1.58	1.53
2	A	3001[C]	P6F	P2-O5P	-2.30	1.46	1.54
2	A	3001[B]	P6F	P2-O5P	-2.30	1.46	1.54
2	A	3001[A]	P6F	O6-C6	-2.28	1.36	1.44
2	A	3001[A]	P6F	O1-C1	-2.03	1.36	1.44
2	A	3001[C]	P6F	P2-O6P	-2.02	1.47	1.54

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	3001[B]	P6F	P2-O6-C6	6.79	136.99	118.30
2	A	3001[C]	P6F	P2-O6-C6	6.18	135.32	118.30
2	A	3001[B]	P6F	O6P-P2-O6	-5.92	90.98	106.73
2	A	3001[C]	P6F	O3-C3-C4	4.71	120.56	109.10
2	A	3001[C]	P6F	O5-C5-C6	-4.33	100.20	109.92
2	A	3001[B]	P6F	O1-C1-C2	4.24	123.62	109.09
2	A	3001[C]	P6F	O1-C1-C2	4.24	123.62	109.09
2	A	3001[C]	P6F	O4-C4-C3	4.00	118.48	108.81
2	A	3001[C]	P6F	O6-C6-C5	3.94	119.89	109.36
2	A	3001[B]	P6F	O5P-P2-O6	3.51	116.08	106.73
2	A	3001[C]	P6F	C6-C5-C4	-2.95	106.51	112.20
2	A	3001[B]	P6F	O5-C5-C4	-2.81	102.27	109.10
3	B	401	13P	O1-P-O1P	2.76	114.20	106.47
2	A	3001[A]	P6F	O5-C5-C4	-2.49	103.05	109.10
3	B	401	13P	O3P-P-O1	2.48	113.34	106.73
3	B	401	13P	O2P-P-O1	2.30	112.85	106.73
2	A	3001[A]	P6F	O6P-P2-O5P	2.22	116.13	107.64
3	B	401	13P	C1-C2-C3	-2.21	109.14	113.95

There are no chirality outliers.

All (26) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	3001[A]	P6F	O1-C1-C2-C3
2	A	3001[A]	P6F	C4-C5-C6-O6
2	A	3001[A]	P6F	O5-C5-C6-O6
2	A	3001[B]	P6F	C6-O6-P2-O5P
2	A	3001[B]	P6F	C6-O6-P2-O6P
2	A	3001[C]	P6F	C2-C3-C4-O4
2	A	3001[C]	P6F	O3-C3-C4-O4
2	A	3001[C]	P6F	O3-C3-C4-C5
2	A	3001[C]	P6F	C4-C5-C6-O6
2	A	3001[C]	P6F	O5-C5-C6-O6
2	A	3001[C]	P6F	C6-O6-P2-O4P
2	A	3001[C]	P6F	C6-O6-P2-O5P
2	A	3001[C]	P6F	C6-O6-P2-O6P
2	A	3001[C]	P6F	C2-C3-C4-C5
2	A	3001[A]	P6F	O3-C3-C4-C5
2	A	3001[B]	P6F	O1-C1-C2-C3
2	A	3001[C]	P6F	O1-C1-C2-C3
2	A	3001[A]	P6F	C2-C3-C4-C5
2	A	3001[A]	P6F	O3-C3-C4-O4
2	A	3001[C]	P6F	C3-C4-C5-C6
2	A	3001[A]	P6F	C1-C2-C3-C4
2	A	3001[A]	P6F	C1-C2-C3-O3
3	A	3002[D]	13P	O1-C1-C2-C3
2	A	3001[C]	P6F	C1-C2-C3-O3
2	A	3001[A]	P6F	C2-C3-C4-O4
3	B	401	13P	O1-C1-C2-C3

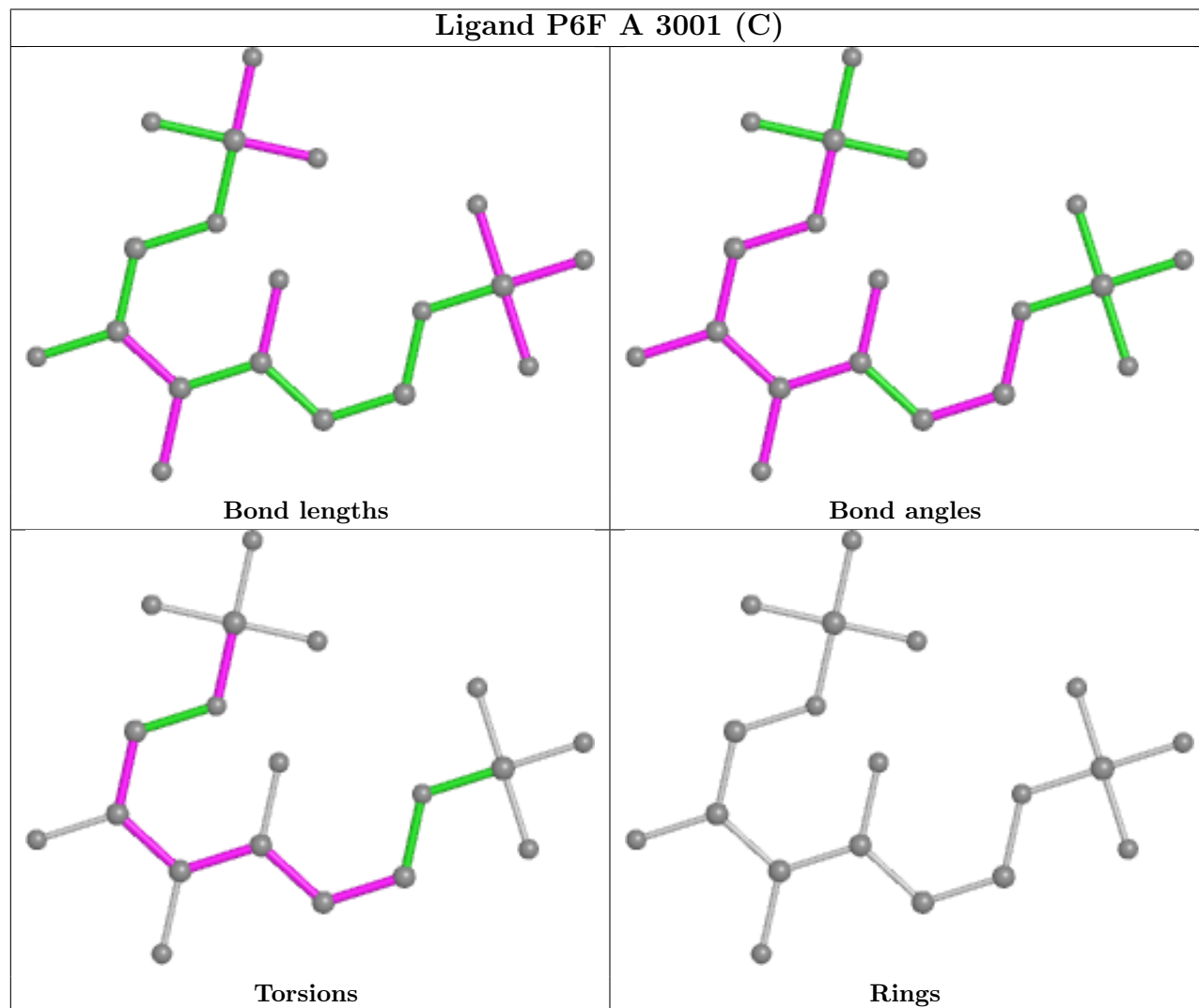
There are no ring outliers.

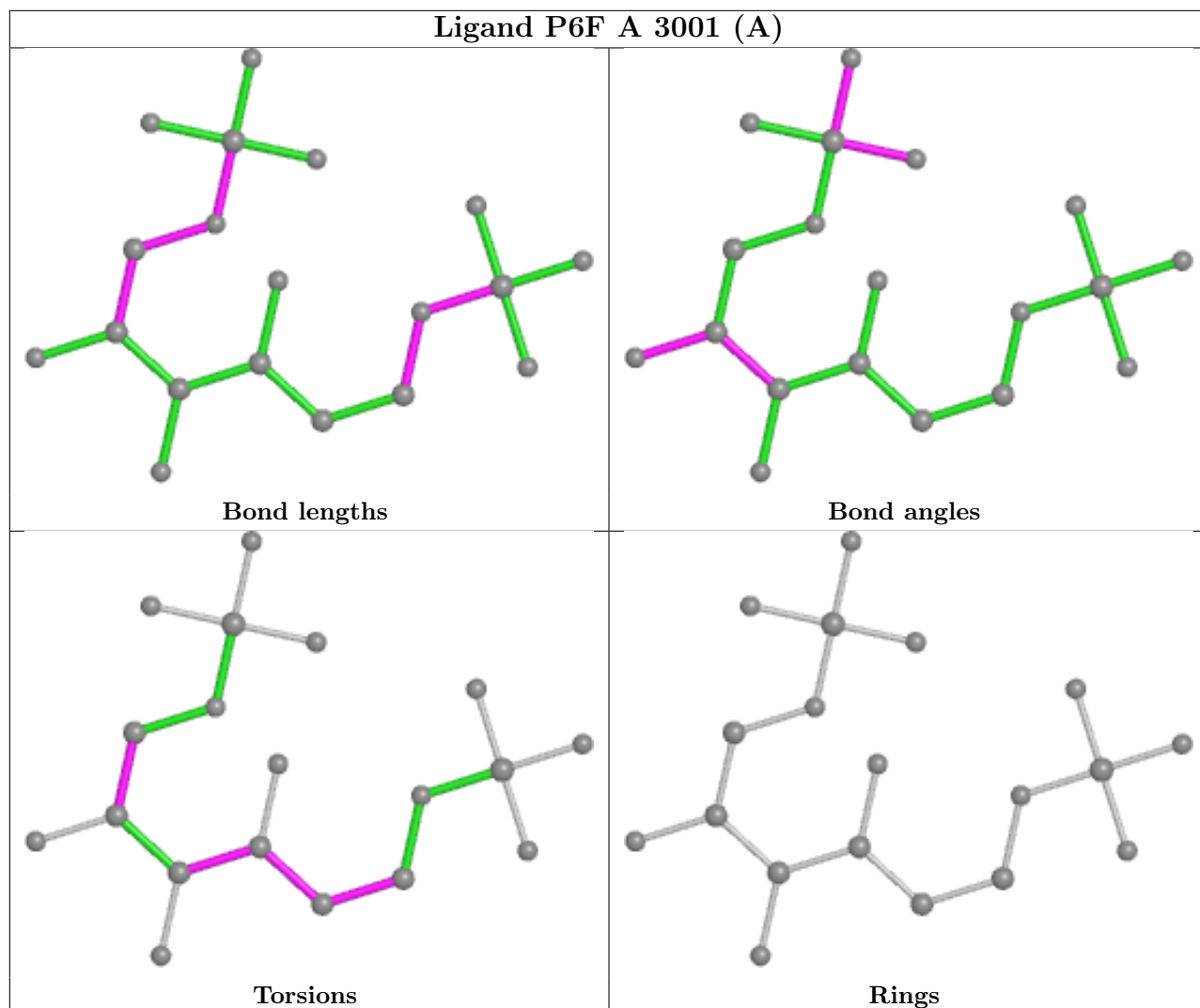
3 monomers are involved in 9 short contacts:

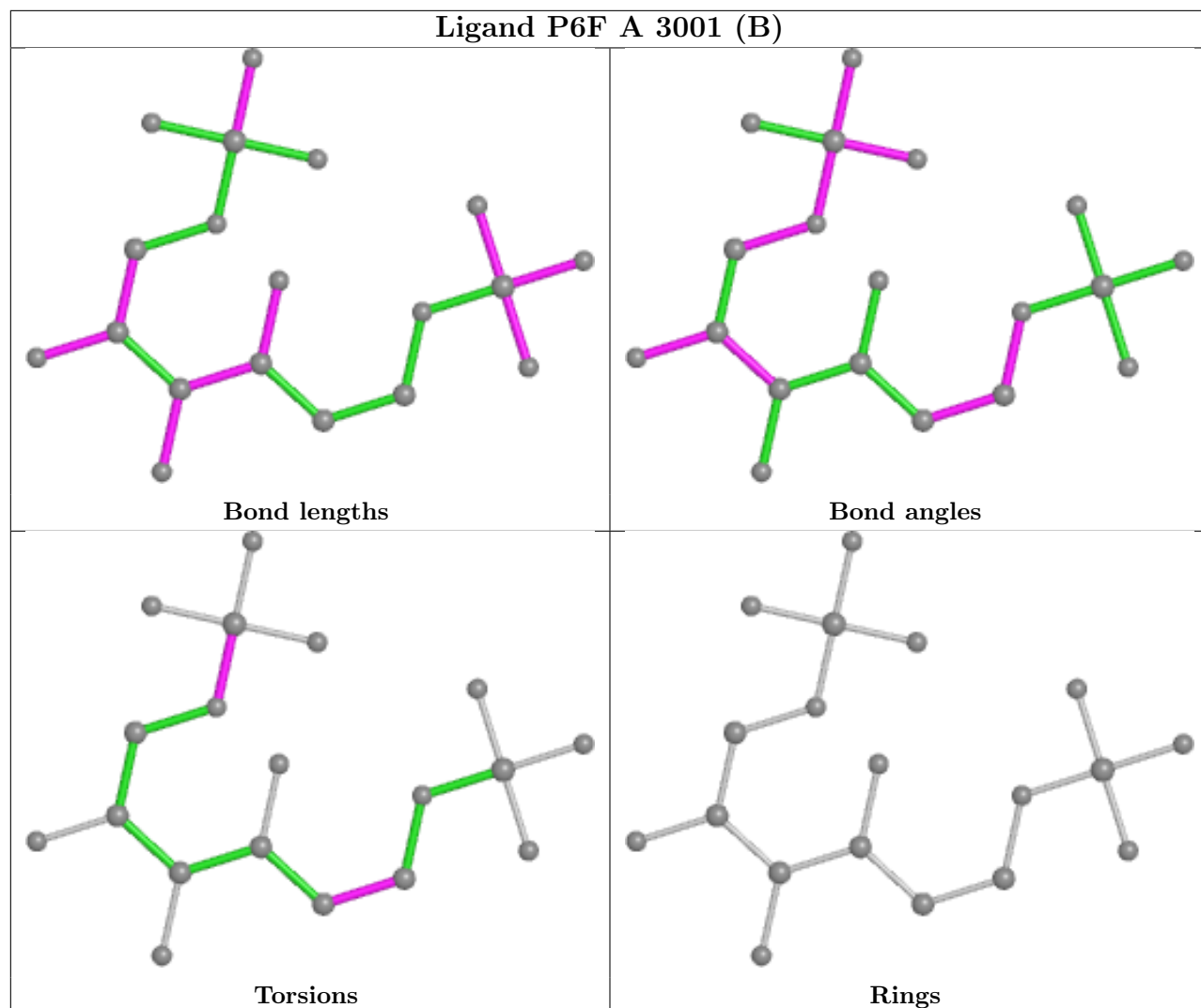
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	3001[C]	P6F	1	0
2	A	3001[B]	P6F	7	0
3	A	3002[D]	13P	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be

highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.







5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

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	324/327 (99%)	0.37	15 (4%) 32 36	13, 23, 53, 98	2 (0%)
1	B	325/327 (99%)	0.33	26 (8%) 12 14	11, 24, 60, 85	4 (1%)
1	C	323/327 (98%)	0.76	47 (14%) 2 2	19, 46, 108, 150	0
1	D	326/327 (99%)	0.60	36 (11%) 5 6	16, 42, 116, 161	1 (0%)
All	All	1298/1308 (99%)	0.52	124 (9%) 8 9	11, 34, 92, 161	7 (0%)

All (124) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	2	ILE	30.5
1	D	41	THR	9.7
1	D	288	TYR	9.0
1	D	37	ALA	8.4
1	B	2	ILE	8.4
1	B	324	GLU	8.2
1	C	289	ILE	8.2
1	C	37	ALA	7.5
1	B	37	ALA	7.3
1	D	289	ILE	7.2
1	D	39	HIS	7.0
1	D	287	VAL	6.9
1	C	28	GLN	6.8
1	D	33	LYS	6.8
1	C	295	ALA	6.5
1	B	289	ILE	5.7
1	D	291	GLU	5.7
1	A	41	THR	5.7
1	C	39	HIS	5.6
1	B	326	MET	5.4
1	D	40	GLN	5.4

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Mol	Chain	Res	Type	RSRZ
1	D	44	PRO	5.3
1	C	49	ILE	5.1
1	C	98	ALA	5.0
1	C	40	GLN	4.9
1	D	295	ALA	4.9
1	D	43	GLU	4.7
1	C	43	GLU	4.7
1	D	326	MET	4.7
1	C	99	THR	4.7
1	A	324	GLU	4.6
1	C	42	LYS	4.5
1	B	41	THR	4.5
1	C	41	THR	4.5
1	D	31	ALA	4.2
1	C	290	GLU	4.1
1	A	37	ALA	4.0
1	D	286	LYS	4.0
1	C	46	VAL	4.0
1	B	220	ASP	4.0
1	C	288	TYR	3.9
1	A	293	PRO	3.9
1	D	290	GLU	3.9
1	C	35	MET	3.7
1	A	295	ALA	3.7
1	D	299	TRP	3.7
1	C	298	GLU	3.6
1	C	296	ALA	3.6
1	D	34	ARG	3.6
1	C	324	GLU	3.6
1	D	2	ILE	3.5
1	C	38	GLN	3.5
1	D	294	GLN	3.5
1	D	292	GLY	3.4
1	C	32	LEU	3.4
1	C	306	LYS	3.4
1	D	36	MET	3.4
1	D	3	THR	3.3
1	C	291	GLU	3.3
1	A	296	ALA	3.2
1	C	285	VAL	3.2
1	B	293	PRO	3.2
1	C	322	TRP	3.1

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Mol	Chain	Res	Type	RSRZ
1	C	252	VAL	3.1
1	D	47	GLU	3.0
1	D	42	LYS	3.0
1	B	285	VAL	3.0
1	D	284	SER	2.9
1	D	35	MET	2.9
1	A	44	PRO	2.8
1	D	46	VAL	2.8
1	C	31	ALA	2.8
1	A	289	ILE	2.8
1	C	171	ILE	2.8
1	B	325	LYS	2.8
1	C	172	ALA	2.8
1	B	294	GLN	2.8
1	B	43	GLU	2.7
1	C	45	THR	2.7
1	C	294	GLN	2.7
1	C	293	PRO	2.7
1	C	47	GLU	2.7
1	B	223	VAL	2.7
1	C	251	GLY	2.6
1	D	298	GLU	2.6
1	D	48	GLN	2.6
1	C	44	PRO	2.6
1	C	111	TRP	2.6
1	D	1	THR	2.6
1	C	136	GLN	2.6
1	D	251	GLY	2.5
1	B	39	HIS	2.5
1	C	283	GLY	2.5
1	C	100	THR	2.5
1	B	38	GLN	2.5
1	B	221	GLY	2.5
1	B	40	GLN	2.5
1	C	34	ARG	2.5
1	C	170	LYS	2.5
1	A	3	THR	2.4
1	B	47	GLU	2.4
1	C	33	LYS	2.4
1	C	36	MET	2.4
1	C	30	GLY	2.4
1	D	250	ALA	2.4

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Mol	Chain	Res	Type	RSRZ
1	B	33	LYS	2.3
1	D	45	THR	2.3
1	D	49	ILE	2.3
1	B	290	GLU	2.3
1	B	252[A]	VAL	2.3
1	A	49	ILE	2.3
1	B	323	THR	2.3
1	D	301	ARG	2.2
1	A	193	VAL	2.2
1	A	194	PHE	2.2
1	A	164	ILE	2.2
1	B	219	ALA	2.2
1	C	308	ILE	2.1
1	B	286	LYS	2.1
1	C	224	LEU	2.1
1	B	48	GLN	2.0
1	A	299	TRP	2.0
1	C	317	LYS	2.0
1	B	17	VAL	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.

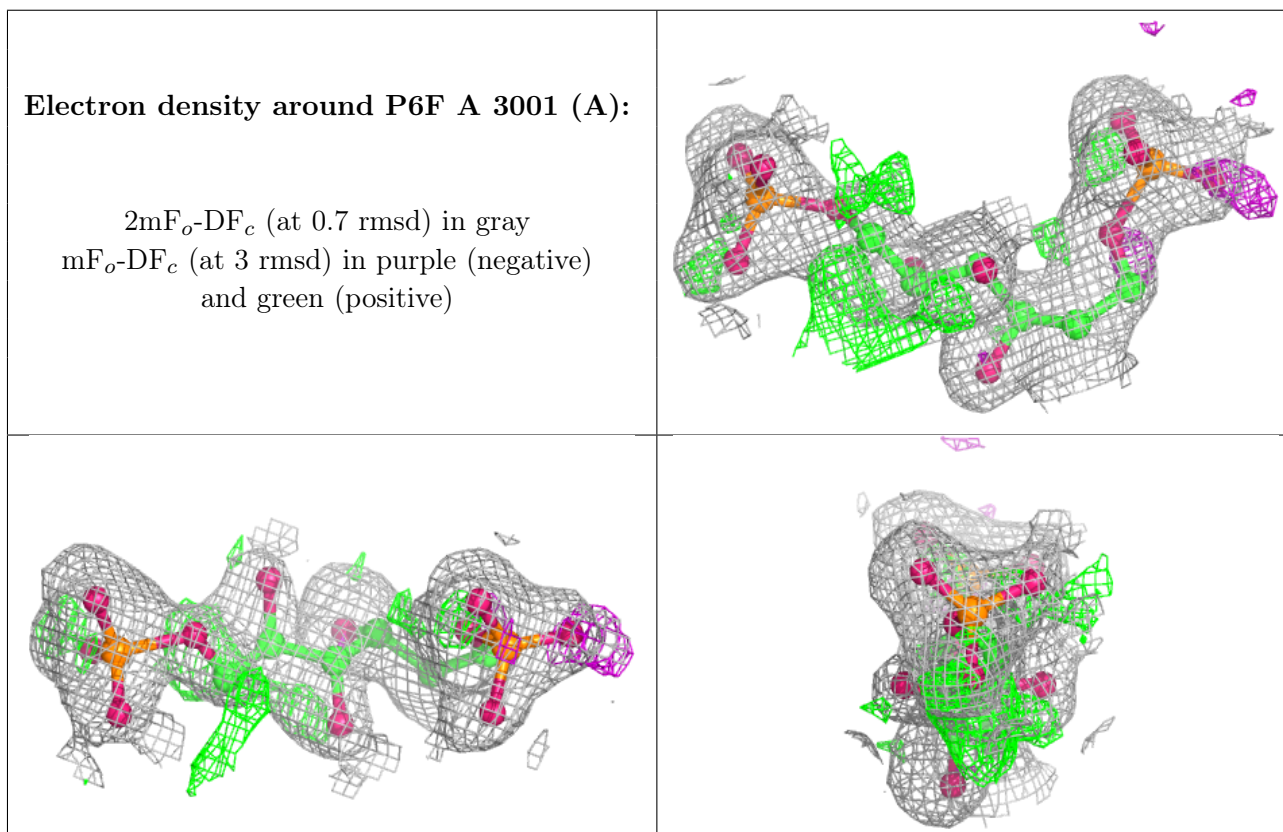
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	P6F	A	3001[A]	19/20	0.94	0.16	19,27,46,46	19
2	P6F	A	3001[B]	19/20	0.94	0.16	15,26,55,57	19
2	P6F	A	3001[C]	19/20	0.94	0.16	15,26,55,57	19
3	13P	A	3002[D]	9/10	0.96	0.10	12,13,40,40	9

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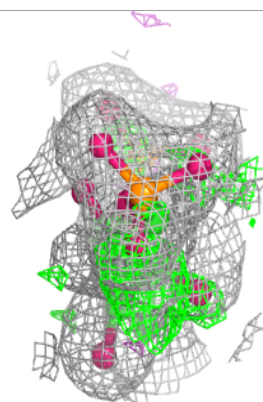
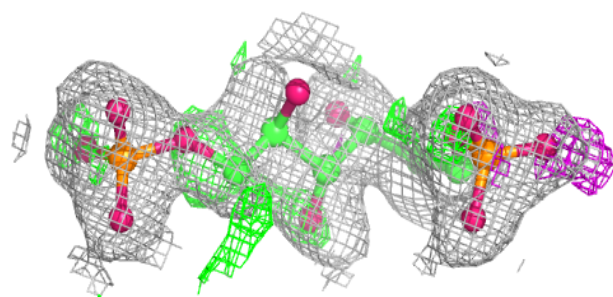
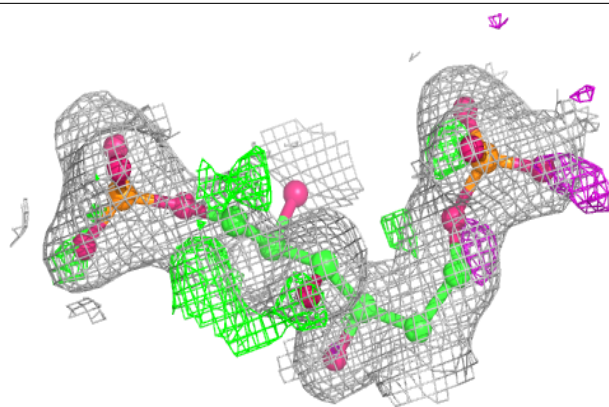
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	13P	B	401	9/10	0.96	0.08	17,28,36,37	14
4	CL	A	3003[D]	1/1	0.98	0.17	71,71,71,71	1
5	CA	C	401	1/1	0.98	0.03	42,42,42,42	0
5	CA	B	402	1/1	0.99	0.05	32,32,32,32	0
5	CA	B	403	1/1	0.99	0.05	24,24,24,24	0
5	CA	A	3005	1/1	0.99	0.09	22,22,22,22	0
5	CA	A	3004	1/1	1.00	0.08	32,32,32,32	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.

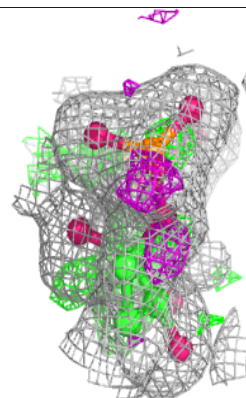
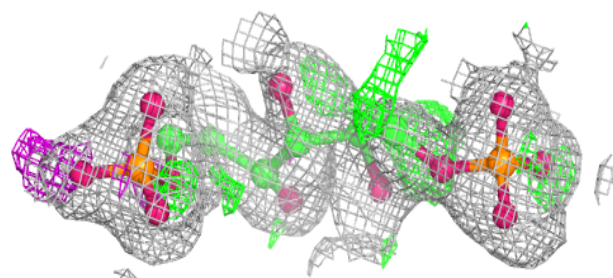
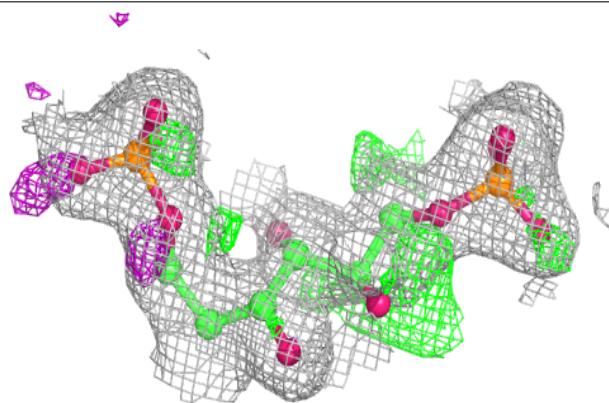


Electron density around P6F A 3001 (B):

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

**Electron density around P6F A 3001 (C):**

$2mF_o-DF_c$ (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.