Full wwPDB X-ray Structure Validation Report (i)

Aug 21, 2023 – 03:13 PM EDT

PDB ID	:	2Q5Q
Title	:	X-ray structure of phenylpyruvate decarboxylase in complex with 3-deaza-ThDP and 5-phenyl-2-oxo-valeric acid
Authors	:	Versees, W.; Spaepen, S.; Wood, M.D.; Leeper, F.J.; Vanderleyden, J.; Steyaert, J.
Deposited on	:	2007-06-01
Resolution	:	1.90 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 (i) 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 (i)) were used in the production of this report:

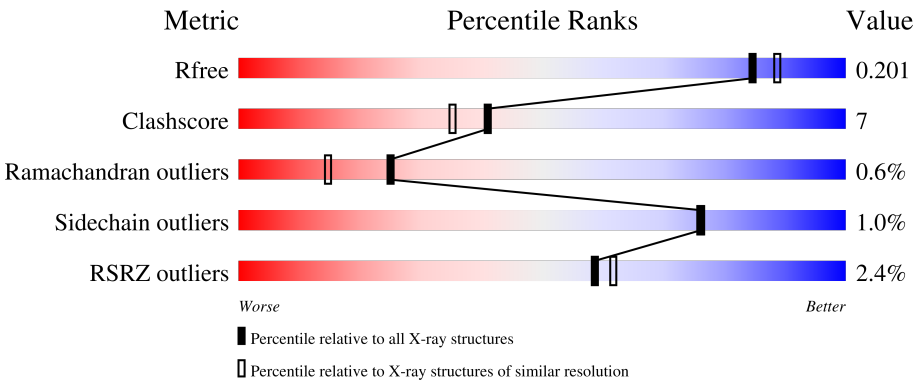
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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	6207 (1.90-1.90)
Clashscore	141614	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)
RSRZ outliers	127900	6082 (1.90-1.90)

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 <=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	565	2% 81% 13% 6%
1	B	565	2% 82% 11% • 5%

2 Entry composition (i)

There are 7 unique types of molecules in this entry. The entry contains 9224 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 Phenylpyruvate decarboxylase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	533	3979	2523	692	740	24	0	6	0
1	B	535	3996	2533	702	738	23	0	3	0

There are 44 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-19	MET	-	expression tag	UNP P51852
A	-18	GLY	-	expression tag	UNP P51852
A	-17	SER	-	expression tag	UNP P51852
A	-16	SER	-	expression tag	UNP P51852
A	-15	HIS	-	expression tag	UNP P51852
A	-14	HIS	-	expression tag	UNP P51852
A	-13	HIS	-	expression tag	UNP P51852
A	-12	HIS	-	expression tag	UNP P51852
A	-11	HIS	-	expression tag	UNP P51852
A	-10	HIS	-	expression tag	UNP P51852
A	-9	SER	-	expression tag	UNP P51852
A	-8	SER	-	expression tag	UNP P51852
A	-7	GLY	-	expression tag	UNP P51852
A	-6	LEU	-	expression tag	UNP P51852
A	-5	VAL	-	expression tag	UNP P51852
A	-4	PRO	-	expression tag	UNP P51852
A	-3	ARG	-	expression tag	UNP P51852
A	-2	GLY	-	expression tag	UNP P51852
A	-1	SER	-	expression tag	UNP P51852
A	0	HIS	-	expression tag	UNP P51852
A	155	GLN	LEU	expression tag	UNP P51852
A	327	ARG	GLY	SEE REMARK 999	UNP P51852
B	-19	MET	-	expression tag	UNP P51852
B	-18	GLY	-	expression tag	UNP P51852
B	-17	SER	-	expression tag	UNP P51852

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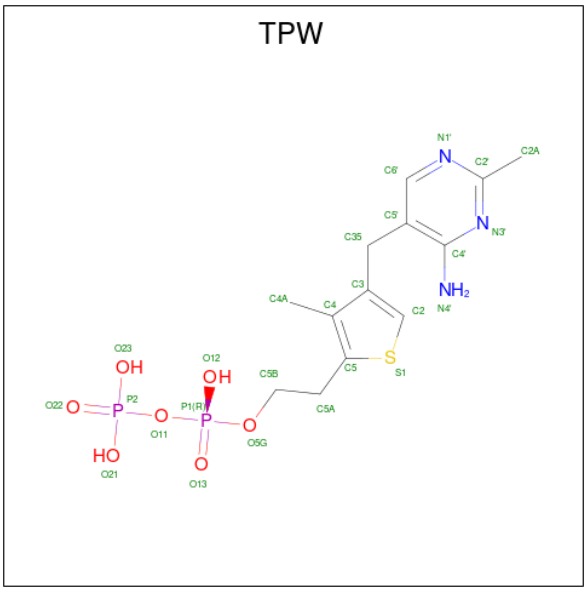
Chain	Residue	Modelled	Actual	Comment	Reference
B	-16	SER	-	expression tag	UNP P51852
B	-15	HIS	-	expression tag	UNP P51852
B	-14	HIS	-	expression tag	UNP P51852
B	-13	HIS	-	expression tag	UNP P51852
B	-12	HIS	-	expression tag	UNP P51852
B	-11	HIS	-	expression tag	UNP P51852
B	-10	HIS	-	expression tag	UNP P51852
B	-9	SER	-	expression tag	UNP P51852
B	-8	SER	-	expression tag	UNP P51852
B	-7	GLY	-	expression tag	UNP P51852
B	-6	LEU	-	expression tag	UNP P51852
B	-5	VAL	-	expression tag	UNP P51852
B	-4	PRO	-	expression tag	UNP P51852
B	-3	ARG	-	expression tag	UNP P51852
B	-2	GLY	-	expression tag	UNP P51852
B	-1	SER	-	expression tag	UNP P51852
B	0	HIS	-	expression tag	UNP P51852
B	155	GLN	LEU	expression tag	UNP P51852
B	327	ARG	GLY	SEE REMARK 999	UNP P51852

- Molecule 2 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

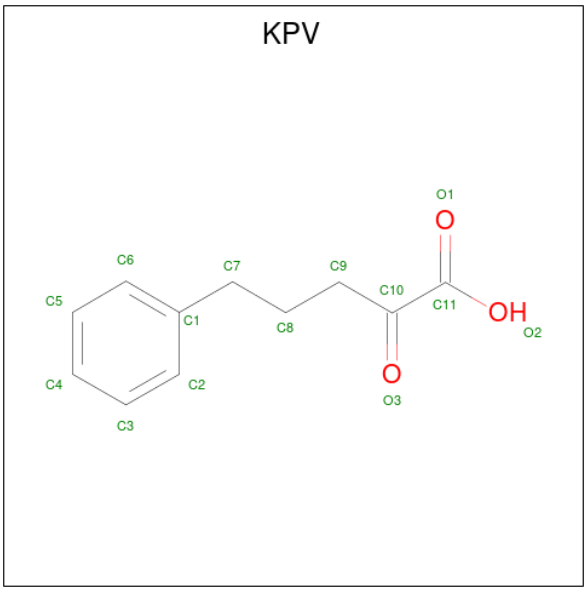
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
2	A	1	1	1	0	0
			Total	Mg		
2	B	1	1	1	0	0

- Molecule 3 is 2-{4-[(4-AMINO-2-METHYLPYRIMIDIN-5-YL)METHYL]-3-METHYL THIOPHEN-2-YL}ETHYL TRIHYDROGEN DIPHOSPHATE (three-letter code: TPW) (formula: $C_{13}H_{19}N_3O_7P_2S$).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
			Total	C	N	O	P	S		
3	A	1	26	13	3	7	2	1	0	0
3	B	1	26	13	3	7	2	1	0	0

- Molecule 4 is 5-PHENYL-2-KETO-VALERIC ACID (three-letter code: KPV) (formula: $C_{11}H_{12}O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
4	A	1	14	11	3	0	0

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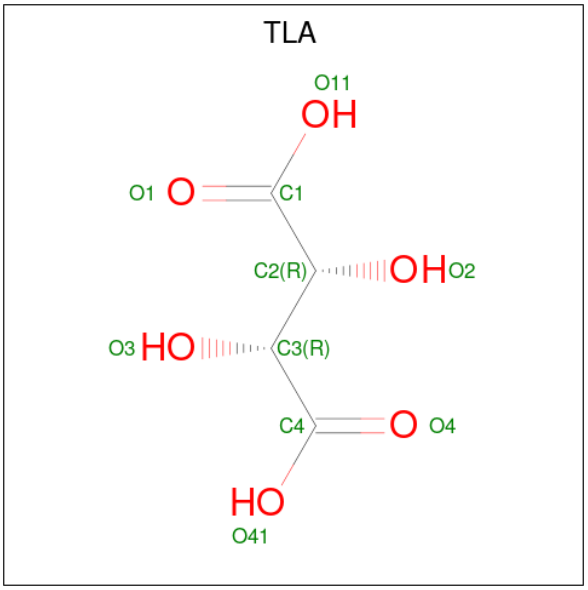
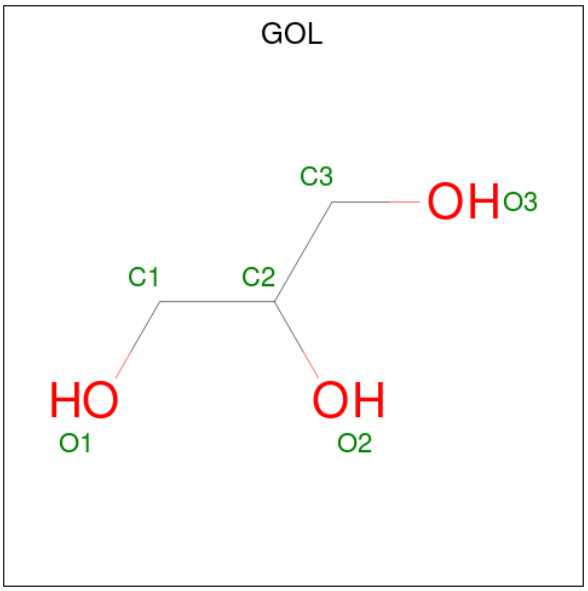
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
4	A	1	14	11	3	0	0
			Total	C	O		
4	B	1	14	11	3	0	0
			Total	C	O		
4	B	1	14	11	3	0	0

- Molecule 5 is L(+)-TARTARIC ACID (three-letter code: TLA) (formula: $C_4H_6O_6$).



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

- Molecule 6 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
6	A	1	6	3	3	0	0
			Total	C	O		
6	B	1	6	3	3	0	0

- Molecule 7 is water.

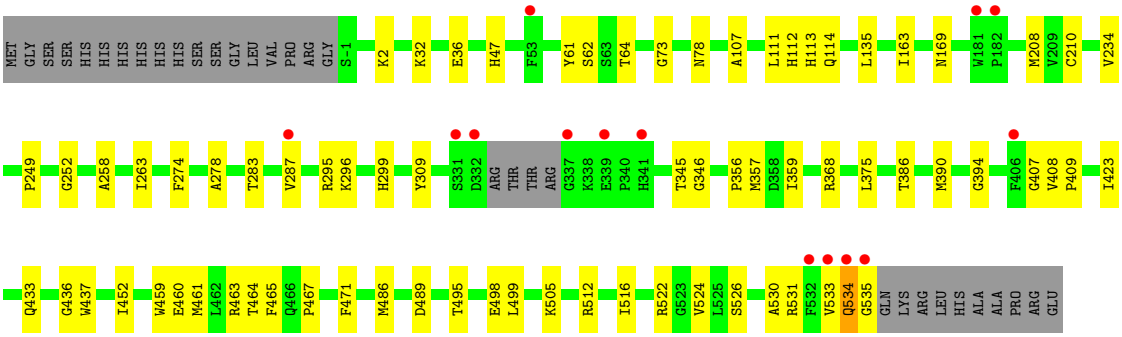
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
7	A	543	543	543	0	0
			Total	O		
7	B	574	574	574	0	0

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.

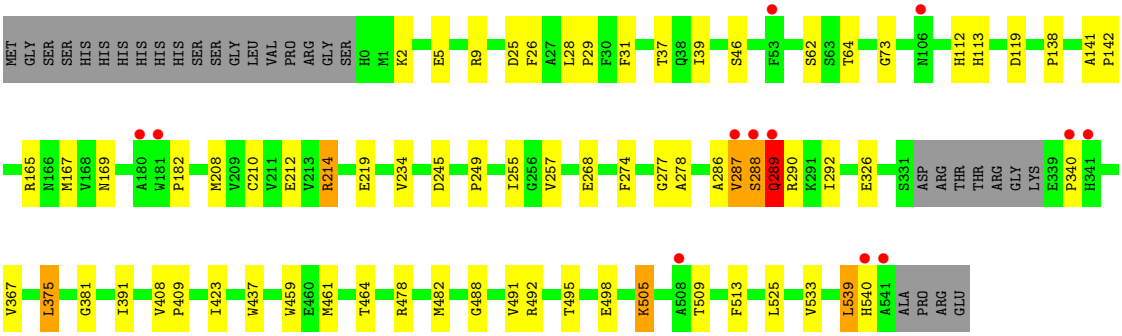
• Molecule 1: Phenylpyruvate decarboxylase

Chain A:



• Molecule 1: Phenylpyruvate decarboxylase

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α, β, γ	74.69Å 145.12Å 194.11Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	34.90 – 1.90 34.85 – 1.90	Depositor EDS
% Data completeness (in resolution range)	92.5 (34.90-1.90) 92.6 (34.85-1.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.07	Depositor
$< I/\sigma(I) >$ [1]	2.08 (at 1.89Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.163 , 0.206 0.158 , 0.201	Depositor DCC
R_{free} test set	3831 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å^2)	23.0	Xtriage
Anisotropy	0.505	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 64.0	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	9224	wwPDB-VP
Average B, all atoms (Å^2)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.54% of the height of the origin peak. No significant pseudotranslation is detected.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: TLA, GOL, MG, KPV, TPW

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	0.41	0/4081	0.65	2/5550 (0.0%)
1	B	0.40	0/4087	0.65	1/5557 (0.0%)
All	All	0.41	0/8168	0.65	3/11107 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	459	TRP	N-CA-C	-5.94	94.96	111.00
1	A	459	TRP	N-CA-C	-5.14	97.11	111.00
1	A	407	GLY	N-CA-C	5.04	125.70	113.10

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	3979	0	3963	63	0
1	B	3996	0	3991	56	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	26	0	16	0	0
3	B	26	0	16	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	A	28	0	22	0	0
4	B	28	0	22	1	0
5	A	10	0	4	0	0
6	A	6	0	8	0	0
6	B	6	0	8	0	0
7	A	543	0	0	7	0
7	B	574	0	0	11	0
All	All	9224	0	8050	115	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 7.

All (115) 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:111:LEU:H	1:A:114:GLN:HE21	1.29	0.81
1:B:249:PRO:HB3	7:B:5361:HOH:O	1.82	0.80
1:B:257:VAL:HG12	1:B:289:GLN:HG2	1.64	0.79
1:B:288:SER:O	1:B:289:GLN:HB2	1.85	0.76
1:B:326:GLU:HG3	7:B:5166:HOH:O	1.90	0.72
1:B:340:PRO:HG3	7:B:5349:HOH:O	1.88	0.72
1:A:464:THR:CG2	1:A:533:VAL:HG21	2.21	0.71
1:B:2:LYS:HD2	1:B:169:ASN:HD22	1.57	0.70
1:A:249:PRO:HB3	7:A:5499:HOH:O	1.91	0.69
1:A:283:THR:HG22	4:B:5002:KPV:H6	1.75	0.69
1:B:286:ALA:C	1:B:288:SER:H	1.96	0.68
1:A:533:VAL:C	1:A:535:GLY:H	1.98	0.66
1:A:2:LYS:HD2	1:A:169:ASN:HD22	1.60	0.65
1:A:295:ARG:HD2	7:A:5175:HOH:O	1.96	0.65
1:A:495:THR:OG1	1:A:498:GLU:HG3	1.95	0.65
1:A:357[A]:MET:HE3	1:A:526:SER:HB2	1.80	0.64
1:A:210:CYS:HB3	1:A:278:ALA:HA	1.80	0.63
1:B:138:PRO:HD3	1:B:167:MET:HE1	1.81	0.63
1:B:5:GLU:HG3	1:B:39[B]:ILE:HD11	1.81	0.63
1:A:463[A]:ARG:HH12	1:A:522:ARG:CG	2.13	0.62
1:B:287:VAL:HG13	7:B:5375:HOH:O	1.98	0.62
1:B:119:ASP:HB2	7:B:5246:HOH:O	2.00	0.61
1:A:375:LEU:HD23	1:A:423:ILE:HD12	1.81	0.61
1:A:135:LEU:HD12	1:A:163[A]:ILE:HD12	1.83	0.60
1:A:287:VAL:HG22	1:A:287:VAL:O	2.01	0.59
1:B:268:GLU:HG2	1:B:292[A]:ILE:HD11	1.85	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:491:VAL:HG21	7:B:5216:HOH:O	2.03	0.58
1:A:463[A]:ARG:NH1	1:A:522:ARG:HD3	2.18	0.57
1:A:530:ALA:O	1:A:533:VAL:HG22	2.04	0.57
1:B:2:LYS:HE2	7:B:5540:HOH:O	2.03	0.57
1:A:368:ARG:NH1	7:A:5485:HOH:O	2.34	0.57
1:B:495:THR:OG1	1:B:498:GLU:HG3	2.05	0.56
1:B:288:SER:O	1:B:289:GLN:CB	2.54	0.56
1:B:289:GLN:O	1:B:290:ARG:HD3	2.06	0.56
1:B:210:CYS:HB3	1:B:278:ALA:HA	1.87	0.55
1:A:408:VAL:HB	1:A:409:PRO:HD3	1.89	0.55
1:A:278:ALA:O	1:A:299:HIS:HE1	1.90	0.54
1:A:464:THR:HG21	1:A:533:VAL:HG21	1.88	0.54
1:A:252:GLY:HA3	1:A:263:ILE:CD1	2.38	0.54
1:A:135:LEU:HD12	1:A:163[A]:ILE:CD1	2.39	0.53
1:B:525:LEU:HD23	1:B:525:LEU:N	2.24	0.52
1:A:463[A]:ARG:NH1	1:A:522:ARG:HB3	2.25	0.52
1:A:2:LYS:HE3	7:A:5097:HOH:O	2.10	0.52
1:A:107:ALA:HB3	7:A:5195:HOH:O	2.09	0.52
1:A:463[A]:ARG:HH12	1:A:522:ARG:HD3	1.76	0.51
1:A:530:ALA:HB1	1:A:534:GLN:NE2	2.26	0.51
1:A:471:PHE:CE2	1:B:31:PHE:HB3	2.45	0.51
1:A:210:CYS:CB	1:A:278:ALA:HA	2.41	0.50
1:B:112:HIS:O	1:B:113:HIS:HB2	2.12	0.50
1:B:539:LEU:HB3	1:B:540:HIS:HD2	1.76	0.50
1:B:212:GLU:HB2	1:B:277:GLY:HA3	1.94	0.50
1:B:141:ALA:HB3	1:B:142:PRO:HD3	1.94	0.49
1:A:463[A]:ARG:HH12	1:A:522:ARG:CD	2.24	0.49
1:A:460:GLU:OE2	1:A:463[B]:ARG:HD2	2.12	0.49
1:B:286:ALA:O	1:B:288:SER:N	2.41	0.49
1:B:288:SER:HA	7:B:5472:HOH:O	2.12	0.49
1:A:359[A]:ILE:HD13	1:A:499:LEU:CD2	2.43	0.49
1:B:25[B]:ASP:OD1	1:B:26:PHE:N	2.46	0.48
1:B:255:ILE:O	1:B:287:VAL:HG11	2.13	0.48
1:B:37:THR:OG1	1:B:39[A]:ILE:HG12	2.12	0.48
1:A:2:LYS:HD2	1:A:169:ASN:ND2	2.27	0.48
1:A:208:MET:HA	1:A:234:VAL:O	2.14	0.48
1:A:464:THR:HG22	1:A:533:VAL:HG21	1.95	0.48
1:B:62:SER:HB2	1:B:64:THR:HG22	1.96	0.47
1:A:359[A]:ILE:HD13	1:A:499:LEU:HD21	1.96	0.47
1:A:533:VAL:C	1:A:535:GLY:N	2.66	0.47
1:B:525:LEU:HD23	1:B:525:LEU:H	1.79	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:286:ALA:C	1:B:288:SER:N	2.65	0.47
1:A:533:VAL:O	1:A:535:GLY:N	2.47	0.47
1:B:375:LEU:HD22	1:B:423:ILE:HD12	1.96	0.47
1:B:381:GLY:HA2	1:B:461:MET:HE3	1.97	0.47
1:A:463[A]:ARG:HH12	1:A:522:ARG:HG2	1.79	0.46
1:A:452[A]:ILE:CD1	1:A:516:ILE:HD12	2.45	0.46
1:B:214:ARG:HG2	7:B:5015:HOH:O	2.15	0.46
1:B:488:GLY:HA3	1:B:513:PHE:CZ	2.51	0.46
1:B:478:ARG:HD3	1:B:492:ARG:NH2	2.31	0.46
1:A:61:TYR:CE1	1:A:375:LEU:HD22	2.51	0.45
1:B:505:LYS:HE3	1:B:509:THR:OG1	2.16	0.45
1:B:464:THR:HG22	1:B:533:VAL:HG11	1.99	0.44
1:B:28:LEU:HB2	1:B:29:PRO:HD3	1.99	0.44
1:B:210:CYS:CB	1:B:278:ALA:HA	2.47	0.44
1:B:9:ARG:HG3	1:B:39[B]:ILE:HD13	1.99	0.44
1:A:112:HIS:O	1:A:113:HIS:HB2	2.18	0.44
1:A:433:GLN:HB3	1:B:46:SER:HB3	2.00	0.44
1:A:533:VAL:HG23	1:A:534:GLN:N	2.33	0.43
1:B:2:LYS:HD2	1:B:169:ASN:ND2	2.29	0.43
1:B:25[B]:ASP:OD2	1:B:112:HIS:NE2	2.46	0.43
1:A:32:LYS:HE3	1:A:36:GLU:OE2	2.18	0.43
1:A:47:HIS:CD2	1:A:78:ASN:HD21	2.37	0.43
1:B:367:VAL:HG11	1:B:391:ILE:HG21	1.99	0.42
1:A:375:LEU:HD12	1:A:394:GLY:C	2.40	0.42
1:B:257:VAL:HG22	1:B:287:VAL:HG12	2.02	0.42
1:B:290:ARG:HG3	1:B:290:ARG:HH11	1.84	0.42
1:A:62:SER:HB2	1:A:64:THR:HG22	2.02	0.42
1:B:28:LEU:HD23	1:B:28:LEU:HA	1.91	0.42
1:A:408:VAL:HG21	1:A:436:GLY:HA2	2.02	0.42
1:A:452[A]:ILE:HD11	1:A:516:ILE:HD12	2.01	0.41
1:A:489:ASP:CG	1:A:512:ARG:HD2	2.39	0.41
1:B:208:MET:HA	1:B:234:VAL:O	2.19	0.41
1:B:182:PRO:HA	7:B:5160:HOH:O	2.21	0.41
1:A:452[A]:ILE:HD13	1:A:516:ILE:HB	2.01	0.41
1:A:258:ALA:HA	1:A:531:ARG:HB2	2.03	0.41
1:A:345:THR:OG1	1:A:346:GLY:N	2.54	0.41
1:A:437:TRP:CD1	1:B:437:TRP:CD1	3.08	0.41
1:A:505:LYS:HD3	7:A:5459:HOH:O	2.21	0.41
1:B:408:VAL:HB	1:B:409:PRO:HD3	2.02	0.41
1:A:461:MET:O	1:A:465:PHE:HD2	2.04	0.40
1:A:486:MET:HG3	1:B:482:MET:CE	2.51	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:296:LYS:NZ	1:A:309:TYR:OH	2.54	0.40
1:A:356:PRO:HD3	1:A:524:VAL:HG12	2.03	0.40
1:A:357[B]:MET:HG2	7:A:5171:HOH:O	2.21	0.40
1:A:386:THR:HG22	1:A:390:MET:HE3	2.03	0.40
1:B:214:ARG:HD2	1:B:219:GLU:OE2	2.22	0.40
1:B:245:ASP:HB3	7:B:5195:HOH:O	2.19	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	535/565 (95%)	523 (98%)	10 (2%)	2 (0%)	34	24
1	B	534/565 (94%)	520 (97%)	10 (2%)	4 (1%)	22	12
All	All	1069/1130 (95%)	1043 (98%)	20 (2%)	6 (1%)	25	15

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	288	SER
1	B	289	GLN
1	A	534	GLN
1	B	287	VAL
1	A	73	GLY
1	B	73	GLY

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	399/426 (94%)	398 (100%)	1 (0%)	92	93
1	B	399/426 (94%)	392 (98%)	7 (2%)	59	55
All	All	798/852 (94%)	790 (99%)	8 (1%)	76	76

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	274	PHE
1	B	165	ARG
1	B	214	ARG
1	B	274	PHE
1	B	289	GLN
1	B	375	LEU
1	B	505	LYS
1	B	539	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	114	GLN
1	A	169	ASN
1	A	299	HIS
1	A	415	GLN
1	A	472	ASN
1	A	534	GLN
1	B	169	ASN
1	B	433	GLN
1	B	540	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 11 ligands modelled in this entry, 2 are monoatomic - leaving 9 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	TPW	B	2001	2	23,27,27	3.46	9 (39%)	30,40,40	2.32	9 (30%)
4	KPV	A	5001	-	14,14,14	1.97	3 (21%)	17,17,17	1.19	2 (11%)
3	TPW	A	2002	2	23,27,27	2.17	7 (30%)	30,40,40	2.36	11 (36%)
4	KPV	A	5004	-	14,14,14	1.67	3 (21%)	17,17,17	1.41	3 (17%)
6	GOL	B	5005	-	5,5,5	0.50	0	5,5,5	0.87	0
5	TLA	A	5007	-	9,9,9	0.93	0	12,12,12	1.20	2 (16%)
6	GOL	A	5006	-	5,5,5	0.53	0	5,5,5	0.86	0
4	KPV	B	5002	-	14,14,14	1.95	3 (21%)	17,17,17	1.17	2 (11%)
4	KPV	B	5003	-	14,14,14	1.63	3 (21%)	17,17,17	1.40	4 (23%)

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	TPW	B	2001	2	-	1/16/17/17	0/2/2/2
4	KPV	A	5001	-	-	2/10/10/10	0/1/1/1
3	TPW	A	2002	2	-	1/16/17/17	0/2/2/2
4	KPV	A	5004	-	-	3/10/10/10	0/1/1/1
6	GOL	B	5005	-	-	0/4/4/4	-
5	TLA	A	5007	-	-	0/12/12/12	-
6	GOL	A	5006	-	-	0/4/4/4	-
4	KPV	B	5002	-	-	1/10/10/10	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	KPV	B	5003	-	-	3/10/10/10	0/1/1/1

All (28) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	2001	TPW	C5A-C5	-12.54	1.45	1.50
3	B	2001	TPW	C2-C3	-6.70	1.33	1.37
3	A	2002	TPW	C5A-C5	-6.67	1.48	1.50
4	B	5002	KPV	O1-C11	4.47	1.34	1.22
4	A	5001	KPV	O1-C11	4.46	1.34	1.22
3	A	2002	TPW	C2-C3	-4.26	1.34	1.37
4	A	5004	KPV	O1-C11	4.20	1.33	1.22
4	B	5003	KPV	O1-C11	3.86	1.32	1.22
4	A	5001	KPV	C10-C11	-3.56	1.48	1.53
3	B	2001	TPW	C4'-N3'	3.33	1.39	1.35
3	A	2002	TPW	C35-C3	3.16	1.58	1.52
3	B	2001	TPW	C35-C3	3.16	1.58	1.52
4	B	5002	KPV	C10-C11	-3.00	1.49	1.53
4	B	5002	KPV	O2-C11	-2.89	1.22	1.30
3	B	2001	TPW	C4'-N4'	2.77	1.41	1.34
4	A	5001	KPV	O2-C11	-2.70	1.22	1.30
3	B	2001	TPW	C2-S1	2.58	1.74	1.70
4	B	5003	KPV	O2-C11	-2.50	1.23	1.30
3	A	2002	TPW	C2-S1	2.29	1.74	1.70
3	A	2002	TPW	C35-C5'	2.28	1.56	1.52
4	A	5004	KPV	O2-C11	-2.25	1.24	1.30
3	B	2001	TPW	C4A-C4	2.21	1.56	1.51
3	B	2001	TPW	C6'-C5'	2.20	1.42	1.37
4	A	5004	KPV	C10-C11	-2.18	1.50	1.53
4	B	5003	KPV	C10-C11	-2.13	1.50	1.53
3	A	2002	TPW	C4'-N4'	2.10	1.39	1.34
3	B	2001	TPW	C6'-N1'	2.03	1.38	1.34
3	A	2002	TPW	C6'-C5'	2.03	1.42	1.37

All (33) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	2002	TPW	C3-C2-S1	-7.92	103.83	112.26
3	B	2001	TPW	C3-C2-S1	-7.88	103.87	112.26
3	A	2002	TPW	P1-O11-P2	-5.30	114.62	132.83
3	B	2001	TPW	P1-O11-P2	-4.55	117.23	132.83
3	B	2001	TPW	C6'-N1'-C2'	3.45	121.83	115.96

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	B	2001	TPW	C2-C3-C4	3.33	118.88	110.34
3	A	2002	TPW	C2-C3-C4	3.29	118.80	110.34
4	A	5004	KPV	C8-C9-C10	-3.29	106.86	113.63
4	B	5003	KPV	C8-C9-C10	-2.97	107.52	113.63
3	A	2002	TPW	C6'-N1'-C2'	2.97	121.01	115.96
4	B	5003	KPV	O2-C11-C10	2.67	121.27	113.97
3	B	2001	TPW	N1'-C2'-N3'	-2.60	121.06	125.54
3	A	2002	TPW	C2'-N3'-C4'	2.57	122.08	118.08
3	A	2002	TPW	N1'-C2'-N3'	-2.55	121.15	125.54
4	A	5004	KPV	O2-C11-C10	2.50	120.81	113.97
4	A	5001	KPV	O2-C11-C10	2.42	120.59	113.97
4	B	5002	KPV	O2-C11-C10	2.40	120.55	113.97
3	A	2002	TPW	O21-P2-O11	2.40	112.69	104.64
3	B	2001	TPW	C5'-C6'-N1'	-2.39	119.84	123.82
3	A	2002	TPW	C5'-C6'-N1'	-2.33	119.94	123.82
3	B	2001	TPW	O21-P2-O11	2.30	112.36	104.64
5	A	5007	TLA	O41-C4-C3	2.28	119.45	113.27
4	B	5003	KPV	C9-C10-C11	2.28	120.20	115.97
3	A	2002	TPW	C2A-C2'-N1'	2.25	119.62	117.14
4	B	5003	KPV	O1-C11-C10	-2.22	118.76	121.72
5	A	5007	TLA	O11-C1-C2	2.16	119.10	113.27
3	B	2001	TPW	P1-O5G-C5B	-2.07	111.37	121.59
4	A	5004	KPV	O1-C11-C10	-2.06	118.97	121.72
4	A	5001	KPV	O1-C11-C10	-2.06	118.97	121.72
3	A	2002	TPW	C35-C3-C4	-2.04	122.84	126.49
3	A	2002	TPW	P1-O5G-C5B	-2.04	111.57	121.59
4	B	5002	KPV	C9-C10-C11	2.02	119.73	115.97
3	B	2001	TPW	C2'-N3'-C4'	2.02	121.23	118.08

There are no chirality outliers.

All (11) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	2001	TPW	P2-O11-P1-O5G
4	A	5004	KPV	C11-C10-C9-C8
4	B	5003	KPV	C11-C10-C9-C8
4	B	5002	KPV	C1-C7-C8-C9
4	A	5001	KPV	C1-C7-C8-C9
3	A	2002	TPW	P2-O11-P1-O5G
4	A	5001	KPV	O3-C10-C11-O2
4	A	5004	KPV	C6-C1-C7-C8
4	A	5004	KPV	C2-C1-C7-C8

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Mol	Chain	Res	Type	Atoms
4	B	5003	KPV	C2-C1-C7-C8
4	B	5003	KPV	C6-C1-C7-C8

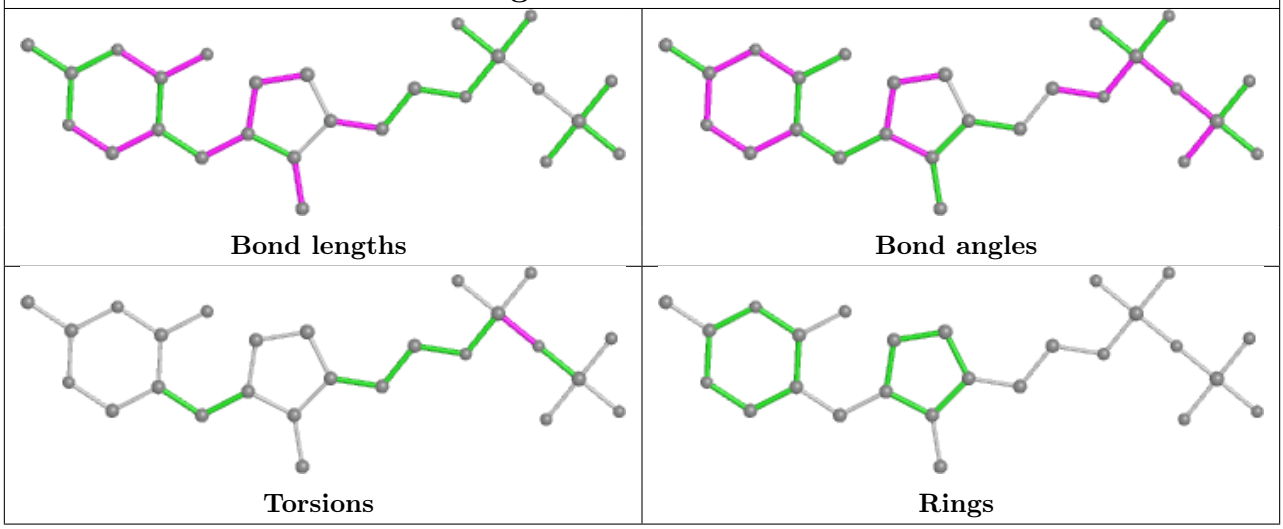
There are no ring outliers.

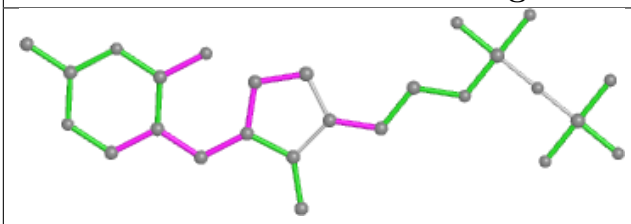
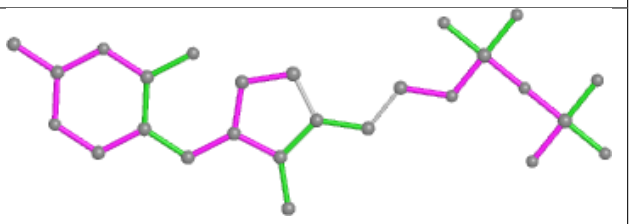
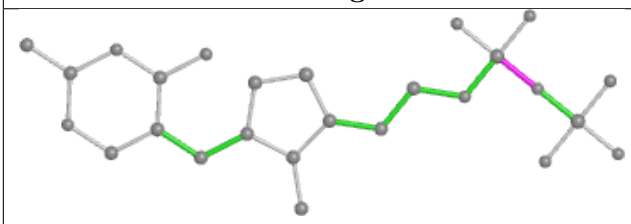
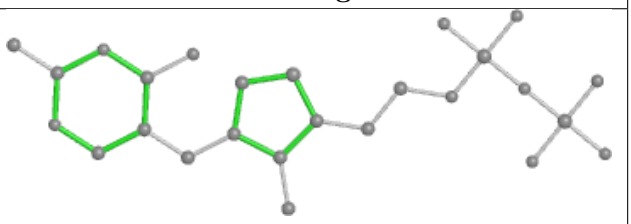
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	5002	KPV	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 then 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 TPW B 2001



Ligand TPW A 2002	
 Bond lengths	 Bond angles
 Torsions	 Rings

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	533/565 (94%)	-0.03	14 (2%)	56	58	14, 23, 40, 72	0
1	B	535/565 (94%)	-0.02	12 (2%)	62	64	15, 23, 38, 65	0
All	All	1068/1130 (94%)	-0.03	26 (2%)	59	62	14, 23, 40, 72	0

All (26) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	332	ASP	5.8
1	B	540	HIS	5.0
1	A	181	TRP	5.0
1	A	182	PRO	4.3
1	A	533	VAL	4.3
1	B	341	HIS	4.0
1	A	337	GLY	4.0
1	A	535	GLY	3.8
1	B	181	TRP	3.5
1	B	106	ASN	3.4
1	A	287	VAL	3.2
1	B	180	ALA	3.2
1	A	532	PHE	3.2
1	B	288	SER	2.9
1	B	541	ALA	2.9
1	B	289	GLN	2.6
1	A	53	PHE	2.6
1	B	340	PRO	2.6
1	B	287	VAL	2.5
1	B	508	ALA	2.5
1	A	331	SER	2.4
1	A	406	PHE	2.3
1	A	341	HIS	2.2
1	A	534	GLN	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	339	GLU	2.0
1	B	53	PHE	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)

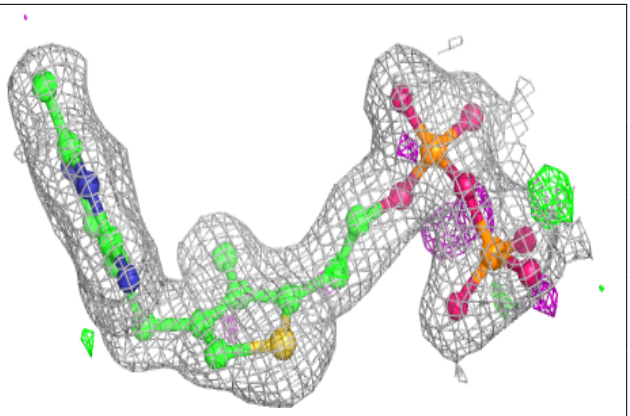
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

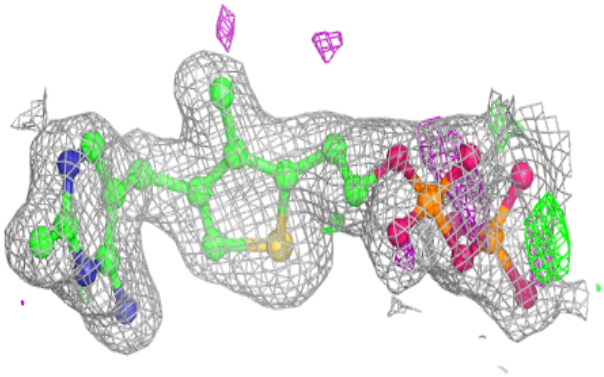
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	KPV	B	5002	14/14	0.84	0.17	39,43,44,45	0
5	TLA	A	5007	10/10	0.90	0.14	42,47,48,48	0
4	KPV	A	5001	14/14	0.92	0.12	25,29,31,32	0
4	KPV	B	5003	14/14	0.95	0.15	18,22,24,24	0
6	GOL	A	5006	6/6	0.95	0.10	24,25,26,30	0
2	MG	A	4002	1/1	0.96	0.06	23,23,23,23	0
4	KPV	A	5004	14/14	0.96	0.12	18,21,24,25	0
3	TPW	A	2002	26/26	0.96	0.13	14,21,26,29	0
6	GOL	B	5005	6/6	0.97	0.09	23,27,28,28	0
3	TPW	B	2001	26/26	0.98	0.10	12,16,20,22	0
2	MG	B	4001	1/1	0.98	0.04	20,20,20,20	0

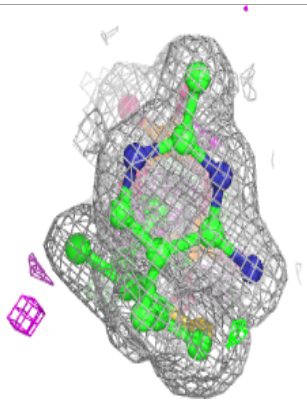
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around TPW A 2002:

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

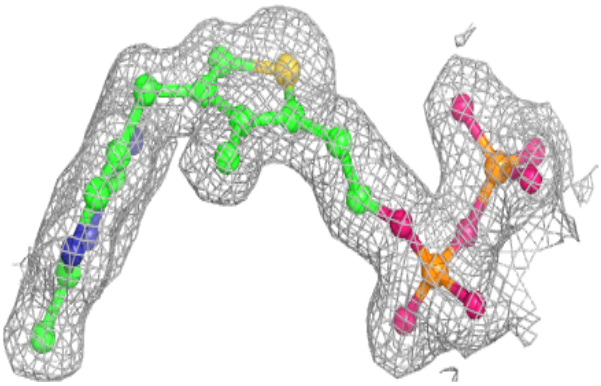


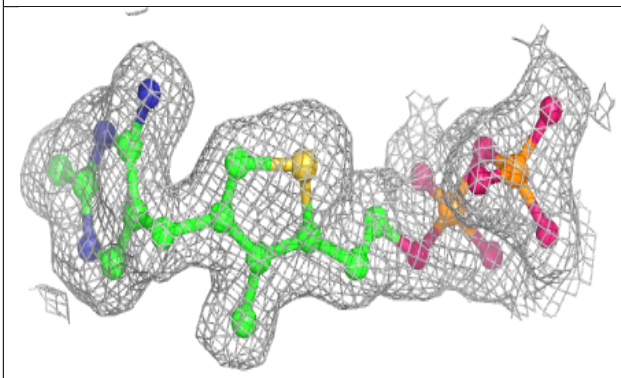


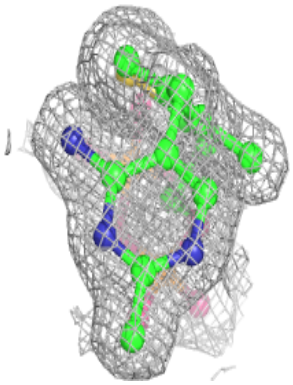


Electron density around TPW B 2001:

$2mF_o$-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.