Full wwPDB X-ray Structure Validation Report (i)

Jun 19, 2024 – 03:57 AM EDT

PDB ID	:	4MOQ
Title	:	Pyranose 2-oxidase V546C mutant with 2-fluorinated galactose
Authors	:	Tan, T.C.; Spadiut, O.; Gandini, R.; Haltrich, D.; Divne, C.
Deposited on	:	2013-09-12
Resolution	:	1.60 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:

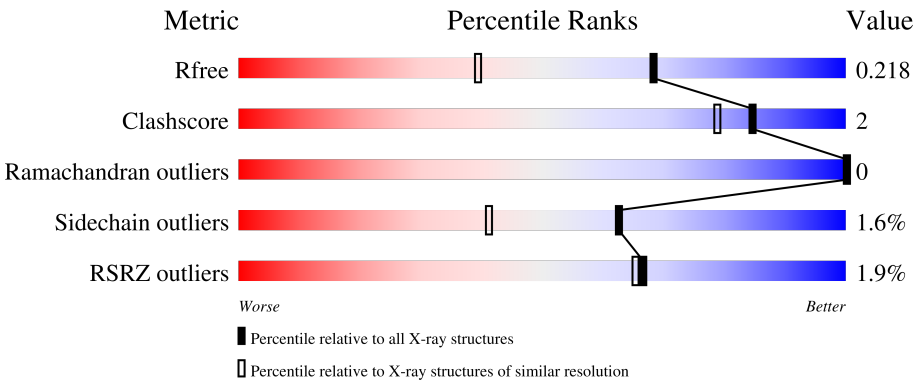
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	2.37.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

1 Overall quality at a glance (i)

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

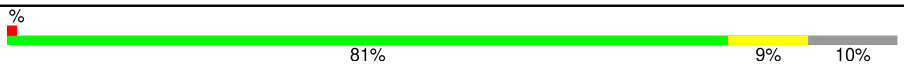
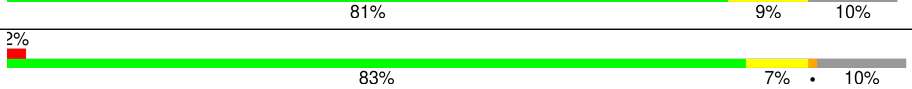
The reported resolution of this entry is 1.60 Å.

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	3398 (1.60-1.60)
Clashscore	141614	3665 (1.60-1.60)
Ramachandran outliers	138981	3564 (1.60-1.60)
Sidechain outliers	138945	3563 (1.60-1.60)
RSRZ outliers	127900	3321 (1.60-1.60)

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	633	
1	B	633	

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 10344 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 Pyranose 2-oxidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	569	4519	2853	771	870	25	0	6	0
1	B	572	4536	2863	774	873	26	0	4	0

There are 26 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	2	ALA	SER	SEE REMARK 999	UNP Q7ZA32
A	546	CYS	VAL	engineered mutation	UNP Q7ZA32
A	623	ALA	-	expression tag	UNP Q7ZA32
A	624	ALA	-	expression tag	UNP Q7ZA32
A	625	ALA	-	expression tag	UNP Q7ZA32
A	626	LEU	-	expression tag	UNP Q7ZA32
A	627	GLU	-	expression tag	UNP Q7ZA32
A	628	HIS	-	expression tag	UNP Q7ZA32
A	629	HIS	-	expression tag	UNP Q7ZA32
A	630	HIS	-	expression tag	UNP Q7ZA32
A	631	HIS	-	expression tag	UNP Q7ZA32
A	632	HIS	-	expression tag	UNP Q7ZA32
A	633	HIS	-	expression tag	UNP Q7ZA32
B	2	ALA	SER	SEE REMARK 999	UNP Q7ZA32
B	546	CYS	VAL	engineered mutation	UNP Q7ZA32
B	623	ALA	-	expression tag	UNP Q7ZA32
B	624	ALA	-	expression tag	UNP Q7ZA32
B	625	ALA	-	expression tag	UNP Q7ZA32
B	626	LEU	-	expression tag	UNP Q7ZA32
B	627	GLU	-	expression tag	UNP Q7ZA32
B	628	HIS	-	expression tag	UNP Q7ZA32
B	629	HIS	-	expression tag	UNP Q7ZA32
B	630	HIS	-	expression tag	UNP Q7ZA32
B	631	HIS	-	expression tag	UNP Q7ZA32
B	632	HIS	-	expression tag	UNP Q7ZA32

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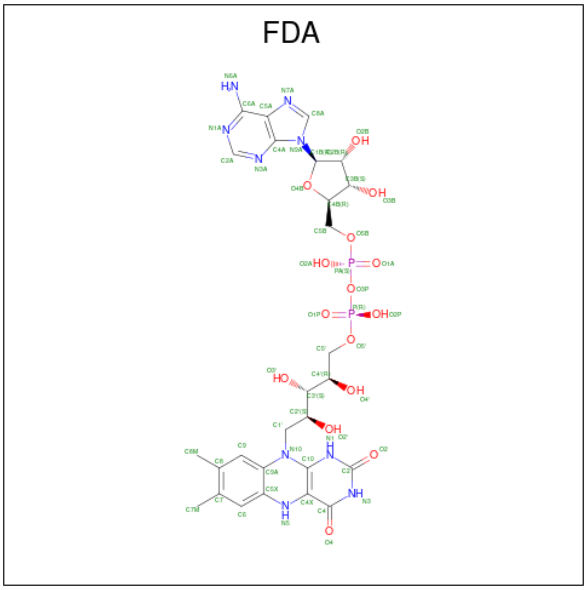
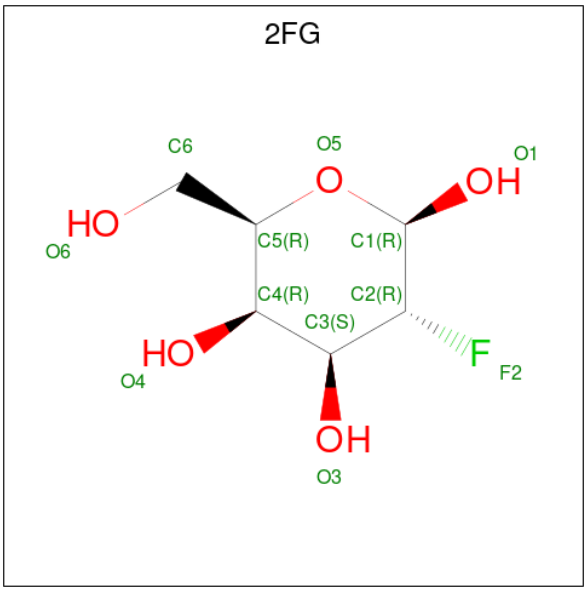
Chain	Residue	Modelled	Actual	Comment	Reference
B	633	HIS	-	expression tag	UNP Q7ZA32

- Molecule 2 is DIHYDROFLAVINE-ADENINE DINUCLEOTIDE (three-letter code: FDA) (formula: $C_{27}H_{35}N_9O_{15}P_2$).



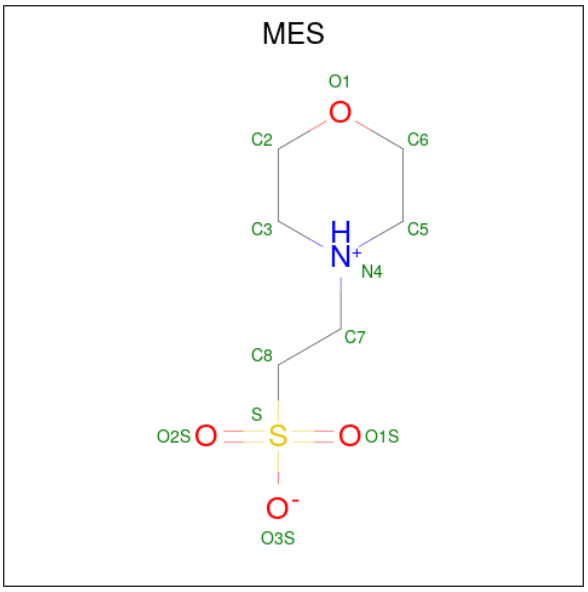
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
2	A	1	53	27	9	15	2	0	0
			Total	C	N	O	P		
2	B	1	53	27	9	15	2	0	0

- Molecule 3 is 2-deoxy-2-fluoro-beta-D-galactopyranose (three-letter code: 2FG) (formula: $C_6H_{11}FO_5$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	F	O		
3	A	1	12	6	1	5	0	0
			Total	C	F	O		
3	A	1	12	6	1	5	0	0
			Total	C	F	O		
3	B	1	12	6	1	5	0	0

- Molecule 4 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (three-letter code: MES) (formula: $C_6H_{13}NO_4S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
4	B	1	12	6	1	4	1	0	0

- Molecule 5 is water.

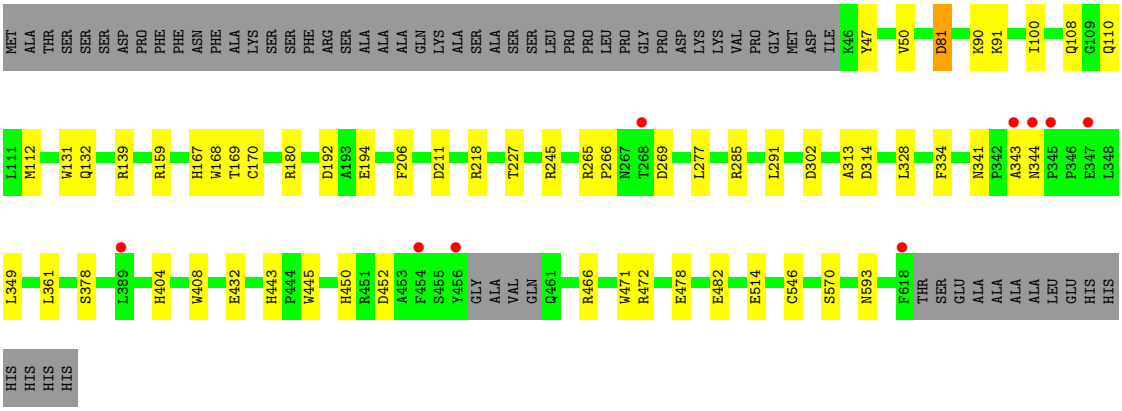
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
5	A	596	596	596	0	0
5	B	539	Total	O	0	0
			539	539		

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.

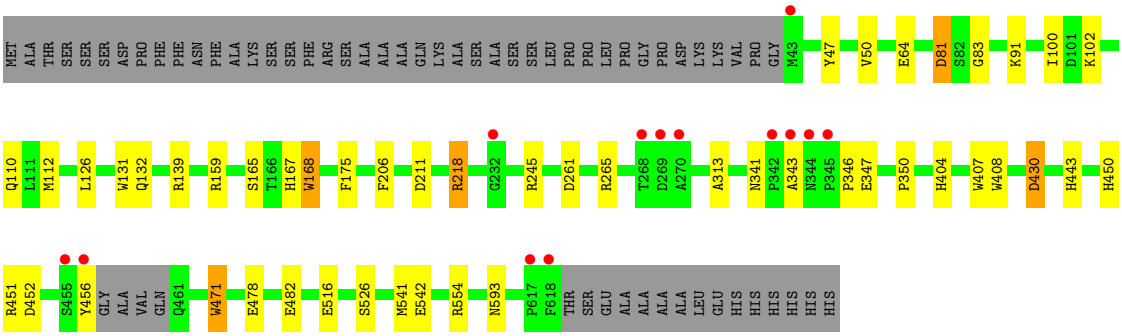
• Molecule 1: Pyranose 2-oxidase

Chain A:



• Molecule 1: Pyranose 2-oxidase

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α, β, γ	101.72Å 101.72Å 251.28Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.32 – 1.60 47.32 – 1.60	Depositor EDS
% Data completeness (in resolution range)	100.0 (47.32-1.60) 100.0 (47.32-1.60)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.11 (at 1.60Å)	Xtriage
Refinement program	REFMAC 5.6.0117	Depositor
R, R_{free}	0.182 , 0.212 0.191 , 0.218	Depositor DCC
R_{free} test set	1737 reflections (1.00%)	wwPDB-VP
Wilson B-factor (Å^2)	16.9	Xtriage
Anisotropy	0.186	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 40.7	EDS
L-test for twinning[2]	$< \|L\| > = 0.44$, $< L^2 > = 0.26$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	10344	wwPDB-VP
Average B, all atoms (Å^2)	18.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 23.85 % 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 4.3016e-03.*

[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: 2FG, MES, FDA

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	1.21	16/4649 (0.3%)	1.14	23/6319 (0.4%)
1	B	1.16	9/4660 (0.2%)	1.07	14/6333 (0.2%)
All	All	1.18	25/9309 (0.3%)	1.10	37/12652 (0.3%)

All (25) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	478	GLU	CD-OE2	9.74	1.36	1.25
1	B	478	GLU	CD-OE1	8.67	1.35	1.25
1	A	211	ASP	CB-CG	8.05	1.68	1.51
1	A	482	GLU	CD-OE1	7.96	1.34	1.25
1	A	432	GLU	CD-OE1	7.68	1.34	1.25
1	B	407	TRP	CD2-CE2	7.05	1.49	1.41
1	A	482	GLU	CG-CD	7.01	1.62	1.51
1	A	482	GLU	CD-OE2	6.96	1.33	1.25
1	A	478	GLU	CD-OE1	6.84	1.33	1.25
1	A	131	TRP	CD2-CE2	6.58	1.49	1.41
1	B	64	GLU	CD-OE1	6.54	1.32	1.25
1	B	83	GLY	C-O	-6.37	1.13	1.23
1	B	482	GLU	CD-OE1	6.29	1.32	1.25
1	B	131	TRP	CD2-CE2	6.23	1.48	1.41
1	B	542	GLU	CD-OE1	5.73	1.31	1.25
1	A	445	TRP	CD2-CE2	5.65	1.48	1.41
1	A	81	ASP	CB-CG	-5.61	1.40	1.51
1	A	570	SER	CB-OG	-5.56	1.35	1.42
1	A	211	ASP	CG-OD1	5.53	1.38	1.25
1	A	194	GLU	CD-OE1	5.52	1.31	1.25
1	A	378	SER	CB-OG	-5.38	1.35	1.42
1	A	471	TRP	CD2-CE2	5.34	1.47	1.41
1	B	443	HIS	CG-CD2	5.07	1.44	1.35
1	B	471	TRP	CD2-CE2	5.04	1.47	1.41

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	514	GLU	CD-OE1	-5.03	1.20	1.25

All (37) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	211	ASP	CB-CG-OD1	14.85	131.66	118.30
1	B	218	ARG	NE-CZ-NH1	13.76	127.18	120.30
1	A	139	ARG	NE-CZ-NH2	-13.25	113.67	120.30
1	A	218	ARG	NE-CZ-NH1	10.98	125.79	120.30
1	A	81	ASP	CB-CG-OD1	-10.81	108.57	118.30
1	B	81	ASP	CB-CG-OD1	-9.24	109.98	118.30
1	B	261	ASP	CB-CG-OD1	7.59	125.13	118.30
1	A	314	ASP	CB-CG-OD1	7.46	125.02	118.30
1	A	139	ARG	NE-CZ-NH1	7.34	123.97	120.30
1	A	328	LEU	CB-CG-CD1	-7.31	98.57	111.00
1	B	81	ASP	CB-CG-OD2	7.13	124.72	118.30
1	A	159	ARG	NE-CZ-NH1	7.06	123.83	120.30
1	A	180	ARG	NE-CZ-NH1	-6.99	116.81	120.30
1	B	265	ARG	NE-CZ-NH1	6.84	123.72	120.30
1	B	451	ARG	NE-CZ-NH1	6.82	123.71	120.30
1	B	218	ARG	NE-CZ-NH2	-6.81	116.89	120.30
1	A	211	ASP	CB-CG-OD2	-6.72	112.25	118.30
1	A	192	ASP	CB-CG-OD2	-6.61	112.35	118.30
1	B	159	ARG	NE-CZ-NH1	6.61	123.60	120.30
1	A	302	ASP	CB-CG-OD1	6.57	124.22	118.30
1	A	81	ASP	CB-CG-OD2	6.57	124.21	118.30
1	A	192	ASP	CB-CG-OD1	6.45	124.11	118.30
1	B	430	ASP	CB-CG-OD2	-6.43	112.52	118.30
1	B	175	PHE	CB-CG-CD1	6.20	125.14	120.80
1	A	472	ARG	NE-CZ-NH1	6.11	123.35	120.30
1	A	291	LEU	CB-CA-C	-6.10	98.61	110.20
1	A	314	ASP	CB-CG-OD2	-5.88	113.01	118.30
1	B	245	ARG	NE-CZ-NH1	5.81	123.20	120.30
1	B	554	ARG	NE-CZ-NH1	5.69	123.15	120.30
1	A	466	ARG	NE-CZ-NH1	5.65	123.13	120.30
1	A	349	LEU	CB-CG-CD2	5.63	120.57	111.00
1	A	277	LEU	CB-CG-CD1	5.41	120.19	111.00
1	A	245	ARG	NE-CZ-NH1	5.33	122.96	120.30
1	A	334	PHE	CB-CG-CD1	5.22	124.46	120.80
1	B	139	ARG	NE-CZ-NH2	-5.15	117.72	120.30
1	A	159	ARG	NE-CZ-NH2	-5.10	117.75	120.30
1	B	516	GLU	OE1-CD-OE2	-5.01	117.29	123.30

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	4519	0	4367	21	0
1	B	4536	0	4379	21	0
2	A	53	0	32	1	0
2	B	53	0	31	0	0
3	A	24	0	22	1	0
3	B	12	0	11	1	0
4	B	12	0	13	0	0
5	A	596	0	0	7	0
5	B	539	0	0	2	0
All	All	10344	0	8855	41	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 2.

All (41) 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:110:GLN:HE21	1:A:167:HIS:HD1	1.20	0.90
1:B:110:GLN:HE21	1:B:167:HIS:HD1	1.26	0.83
1:A:443:HIS:HD2	5:A:978:HOH:O	1.62	0.82
1:A:50:VAL:HG13	1:A:313:ALA:HB2	1.77	0.67
1:B:341:ASN:HD21	1:B:343:ALA:HB3	1.62	0.65
1:B:456:TYR:CD1	1:B:541:MET:CE	2.83	0.62
1:B:456:TYR:CD1	1:B:541:MET:HE1	2.36	0.59
1:A:81:ASP:OD1	1:A:81:ASP:C	2.39	0.59
1:B:132:GLN:HG2	5:B:1183:HOH:O	2.01	0.59
1:A:341:ASN:ND2	5:A:1472:HOH:O	2.35	0.57
1:B:404:HIS:HE1	5:B:1138:HOH:O	1.88	0.57
1:B:81:ASP:OD1	1:B:81:ASP:N	2.35	0.57
1:A:404:HIS:HE1	5:A:1045:HOH:O	1.87	0.57
1:B:50:VAL:HG13	1:B:313:ALA:HB2	1.87	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:443:HIS:HE1	5:A:1235:HOH:O	1.91	0.54
1:B:456:TYR:CG	1:B:541:MET:HE1	2.42	0.53
1:A:452:ASP:OD2	3:A:802:2FG:O3	2.21	0.52
1:B:341:ASN:ND2	1:B:343:ALA:HB3	2.26	0.50
1:A:169:THR:O	1:A:170:CYS:HB2	2.12	0.49
1:B:456:TYR:CD1	1:B:541:MET:HE2	2.48	0.49
1:A:227[B]:THR:CG2	5:A:1082:HOH:O	2.61	0.48
1:A:81:ASP:O	1:A:90:LYS:HE2	2.15	0.46
1:B:91:LYS:HD2	1:B:100:ILE:HD11	1.96	0.46
1:A:169:THR:HB	2:A:801:FDA:HN5	1.81	0.46
1:B:456:TYR:CG	1:B:541:MET:CE	2.98	0.46
1:A:227[B]:THR:HG23	5:A:1082:HOH:O	2.14	0.46
1:B:218:ARG:HG3	1:B:430:ASP:OD2	2.15	0.46
1:B:452:ASP:OD2	3:B:802:2FG:O3	2.27	0.44
1:A:132:GLN:HG2	5:A:1154:HOH:O	2.16	0.44
1:A:91:LYS:HD2	1:A:100:ILE:HD11	1.99	0.44
1:B:47:TYR:O	1:B:313:ALA:HA	2.17	0.43
1:B:126:LEU:HD12	1:B:132:GLN:HG3	2.00	0.43
1:B:346:PRO:HG2	1:B:350:PRO:HA	2.00	0.43
1:B:471:TRP:CH2	1:B:526:SER:HA	2.53	0.43
1:A:47:TYR:O	1:A:313:ALA:HA	2.18	0.43
1:A:108:GLN:O	1:B:102:LYS:HE3	2.19	0.42
1:A:265:ARG:HA	1:A:266:PRO:C	2.40	0.41
1:A:361:LEU:HD22	1:A:546:CYS:HB3	2.02	0.41
1:A:343:ALA:C	1:A:344:ASN:HD22	2.24	0.41
1:A:344:ASN:HD22	1:A:344:ASN:N	2.18	0.41
1:B:165:SER:HA	1:B:168:TRP:CD1	2.56	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	571/633 (90%)	558 (98%)	13 (2%)	0	100	100
1	B	572/633 (90%)	556 (97%)	16 (3%)	0	100	100
All	All	1143/1266 (90%)	1114 (98%)	29 (2%)	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	505/548 (92%)	497 (98%)	8 (2%)	62	41
1	B	506/548 (92%)	498 (98%)	8 (2%)	62	41
All	All	1011/1096 (92%)	995 (98%)	16 (2%)	62	41

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	112	MET
1	A	168	TRP
1	A	206	PHE
1	A	269	ASP
1	A	285	ARG
1	A	408	TRP
1	A	450	HIS
1	A	593	ASN
1	B	112	MET
1	B	168	TRP
1	B	206	PHE
1	B	211	ASP
1	B	347	GLU
1	B	408	TRP
1	B	450	HIS
1	B	593	ASN

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	341	ASN
1	A	344	ASN
1	A	404	HIS
1	A	419	HIS
1	A	443	HIS
1	A	563	ASN
1	B	324	HIS
1	B	341	ASN
1	B	404	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)

6 ligands are modelled in this entry.

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	2FG	A	802	-	12,12,12	1.42	2 (16%)	16,17,17	1.49	4 (25%)
2	FDA	A	801	1	53,58,58	1.67	11 (20%)	64,89,89	1.99	18 (28%)
3	2FG	A	803	-	12,12,12	1.00	0	16,17,17	1.74	1 (6%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	FDA	B	801	1	53,58,58	1.66	14 (26%)	64,89,89	1.98	18 (28%)
3	2FG	B	802	-	12,12,12	1.19	2 (16%)	16,17,17	1.53	3 (18%)
4	MES	B	803	-	12,12,12	1.82	2 (16%)	15,16,16	1.56	3 (20%)

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	2FG	A	802	-	-	2/2/22/22	0/1/1/1
2	FDA	A	801	1	-	1/30/50/50	0/6/6/6
3	2FG	A	803	-	-	1/2/22/22	0/1/1/1
2	FDA	B	801	1	-	2/30/50/50	0/6/6/6
3	2FG	B	802	-	-	1/2/22/22	0/1/1/1
4	MES	B	803	-	-	3/6/14/14	0/1/1/1

All (31) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	801	FDA	C5X-C9A	4.61	1.45	1.40
4	B	803	MES	C8-S	-4.55	1.71	1.77
2	A	801	FDA	C4X-C4	4.45	1.55	1.41
2	B	801	FDA	C2'-C3'	4.18	1.60	1.53
2	B	801	FDA	C2A-N3A	3.99	1.38	1.32
3	A	802	2FG	C2-C1	-3.65	1.49	1.52
2	A	801	FDA	C8M-C8	3.39	1.57	1.51
2	B	801	FDA	C5'-C4'	3.20	1.56	1.51
2	A	801	FDA	C9-C9A	3.13	1.44	1.39
2	B	801	FDA	C1B-N9A	-2.95	1.42	1.49
2	A	801	FDA	C5'-C4'	2.87	1.55	1.51
4	B	803	MES	O1S-S	2.84	1.53	1.45
2	B	801	FDA	O3B-C3B	-2.82	1.36	1.43
2	B	801	FDA	O2-C2	2.79	1.29	1.23
2	A	801	FDA	O4B-C4B	-2.71	1.39	1.45
2	B	801	FDA	C2B-C3B	-2.66	1.46	1.53
2	B	801	FDA	C1'-N10	2.61	1.54	1.47
2	B	801	FDA	C4X-C4	2.55	1.49	1.41
2	B	801	FDA	C5X-C9A	2.52	1.43	1.40
3	B	802	2FG	C2-C1	-2.41	1.50	1.52
2	A	801	FDA	C2A-N1A	2.39	1.38	1.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	801	FDA	C8M-C8	2.36	1.55	1.51
3	B	802	2FG	O5-C1	2.30	1.48	1.42
2	A	801	FDA	C2-N1	-2.30	1.33	1.37
2	A	801	FDA	PA-O3P	2.30	1.62	1.59
2	A	801	FDA	P-O3P	2.23	1.61	1.59
3	A	802	2FG	F2-C2	-2.23	1.36	1.40
2	A	801	FDA	C5X-N5	-2.17	1.36	1.39
2	B	801	FDA	C9-C9A	2.10	1.43	1.39
2	B	801	FDA	PA-O3P	2.10	1.61	1.59
2	B	801	FDA	O4B-C4B	-2.01	1.40	1.45

All (47) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	801	FDA	C5A-C6A-N6A	6.87	130.78	120.31
2	B	801	FDA	C5A-C6A-N6A	5.77	129.11	120.31
3	A	803	2FG	F2-C2-C3	5.12	113.25	108.81
2	A	801	FDA	C4B-O4B-C1B	-5.10	105.25	109.92
2	B	801	FDA	O4B-C1B-N9A	4.81	115.12	108.75
2	B	801	FDA	O4-C4-C4X	-4.48	116.46	127.26
2	A	801	FDA	C6A-C5A-C4A	4.03	125.74	117.90
2	B	801	FDA	N3A-C2A-N1A	-4.00	123.24	128.67
2	A	801	FDA	C4A-C5A-N7A	-3.97	105.14	109.34
2	B	801	FDA	C9A-C5X-N5	3.93	124.16	119.37
2	A	801	FDA	O4-C4-N3	3.86	127.37	120.11
2	A	801	FDA	C5A-C6A-N1A	-3.54	111.79	120.23
2	B	801	FDA	C5A-C6A-N1A	-3.33	112.29	120.23
2	A	801	FDA	C1'-N10-C9A	3.26	126.97	120.63
2	B	801	FDA	O3B-C3B-C4B	3.12	120.04	111.08
3	B	802	2FG	C1-C2-C3	-3.09	106.10	110.69
2	B	801	FDA	C4-C4X-N5	2.96	123.94	116.37
2	B	801	FDA	O4-C4-N3	2.87	125.52	120.11
2	A	801	FDA	O2'-C2'-C3'	2.86	115.95	109.25
2	A	801	FDA	O4-C4-C4X	-2.85	120.38	127.26
3	A	802	2FG	O4-C4-C5	2.74	116.07	109.32
2	B	801	FDA	C4A-C5A-N7A	-2.74	106.45	109.34
2	A	801	FDA	O4B-C4B-C3B	2.70	110.52	105.15
2	B	801	FDA	O3B-C3B-C2B	2.68	120.40	111.82
2	B	801	FDA	O4B-C4B-C5B	2.67	117.89	109.33
4	B	803	MES	O3S-S-C8	2.64	111.18	106.00
3	A	802	2FG	C1-C2-C3	-2.64	106.76	110.69
4	B	803	MES	O3S-S-O1S	-2.64	104.79	111.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	B	802	2FG	O4-C4-C5	2.60	115.74	109.32
2	A	801	FDA	C5'-C4'-C3'	-2.60	107.31	112.22
2	A	801	FDA	C1B-N9A-C4A	2.58	131.17	126.64
2	A	801	FDA	O2-C2-N3	-2.58	117.28	121.86
2	A	801	FDA	C4'-C3'-C2'	-2.46	109.48	113.57
2	B	801	FDA	O5'-P-O1P	-2.43	99.30	108.94
4	B	803	MES	C7-N4-C5	2.40	117.63	111.24
2	B	801	FDA	C6A-C5A-C4A	2.38	122.53	117.90
3	A	802	2FG	O3-C3-C2	-2.34	105.30	109.63
3	A	802	2FG	C1-O5-C5	-2.23	109.33	113.65
2	A	801	FDA	C8M-C8-C9	-2.21	115.67	119.57
2	B	801	FDA	C7M-C7-C6	-2.20	115.70	119.57
2	A	801	FDA	N3-C2-N1	2.19	119.18	115.74
2	B	801	FDA	C8M-C8-C7	2.19	125.22	120.76
2	A	801	FDA	O2A-PA-O3P	2.15	113.09	107.27
2	A	801	FDA	O5B-C5B-C4B	2.13	116.24	108.99
2	B	801	FDA	O2A-PA-O1A	2.03	121.88	112.44
2	B	801	FDA	O4'-C4'-C5'	-2.02	105.53	109.99
3	B	802	2FG	O1-C1-C2	-2.01	100.99	109.33

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	801	FDA	PA-O3P-P-O5'
4	B	803	MES	C8-C7-N4-C5
3	B	802	2FG	O5-C5-C6-O6
3	A	802	2FG	O5-C5-C6-O6
4	B	803	MES	N4-C7-C8-S
4	B	803	MES	C8-C7-N4-C3
2	A	801	FDA	PA-O3P-P-O5'
3	A	802	2FG	C4-C5-C6-O6
3	A	803	2FG	O5-C5-C6-O6
2	B	801	FDA	P-O3P-PA-O2A

There are no ring outliers.

3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	802	2FG	1	0
2	A	801	FDA	1	0

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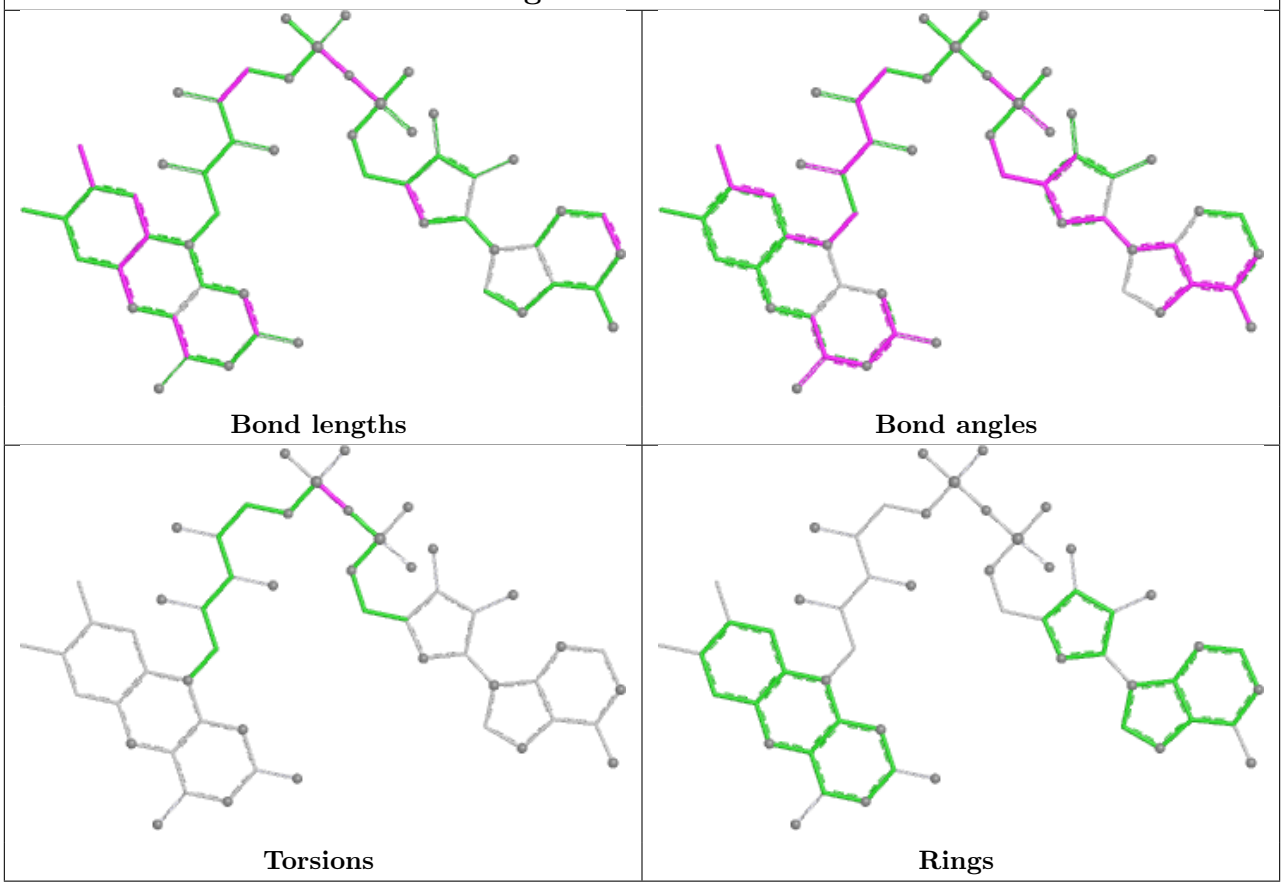
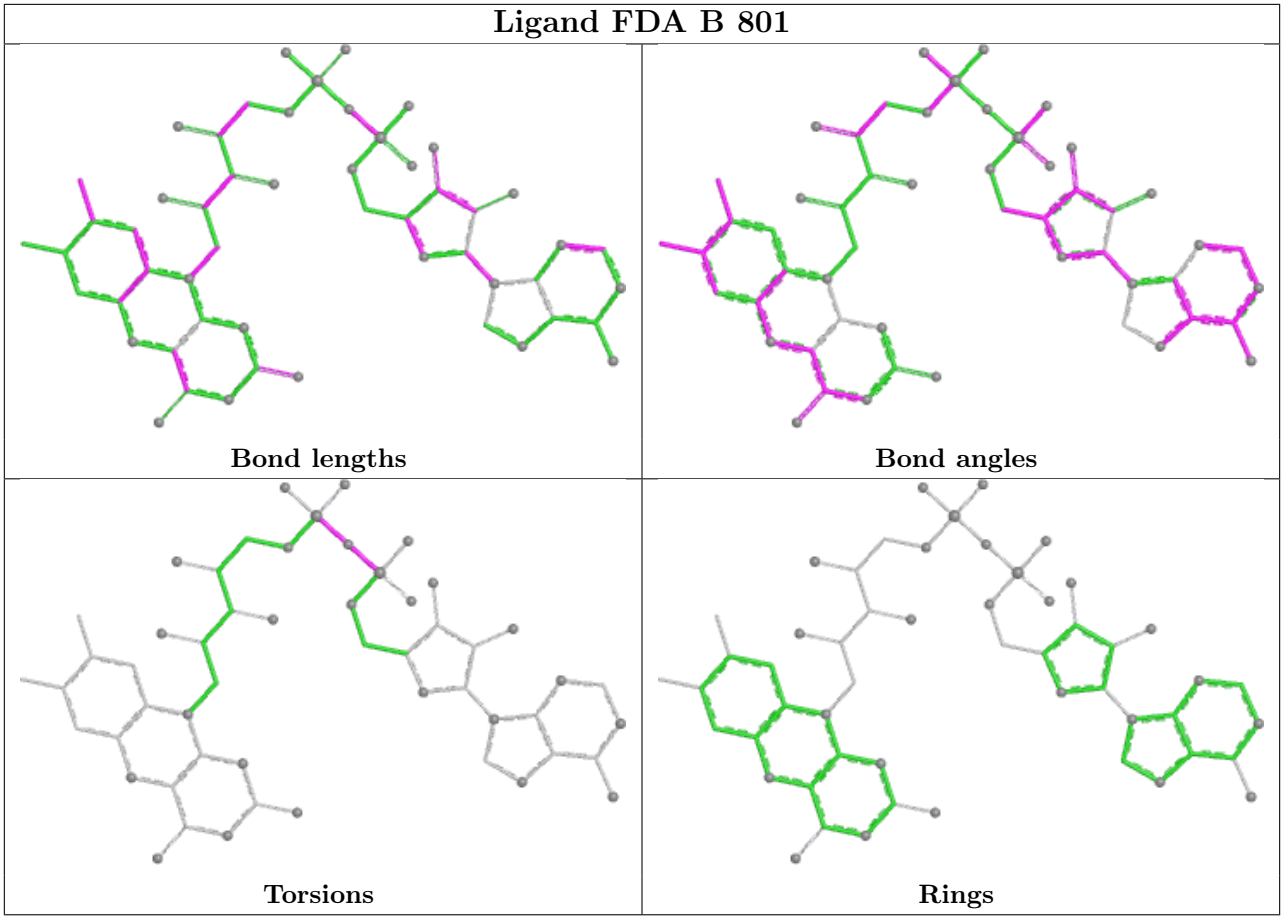
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	802	2FG	1	0

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 FDA A 801





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	569/633 (89%)	-0.37	9 (1%)	72	71	10, 14, 32, 54	0
1	B	572/633 (90%)	-0.32	13 (2%)	60	59	10, 16, 35, 65	0
All	All	1141/1266 (90%)	-0.35	22 (1%)	66	65	10, 15, 33, 65	0

All (22) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	343	ALA	5.7
1	B	618	PHE	4.6
1	A	618	PHE	3.9
1	B	345	PRO	3.7
1	A	456	TYR	3.6
1	A	345	PRO	3.3
1	B	455	SER	3.2
1	A	343	ALA	2.9
1	B	342	PRO	2.8
1	B	232	GLY	2.7
1	A	389	LEU	2.6
1	B	617	PRO	2.6
1	B	456	TYR	2.6
1	B	43	MET	2.6
1	B	344	ASN	2.6
1	B	268	THR	2.4
1	B	270	ALA	2.4
1	A	347	GLU	2.3
1	A	268	THR	2.3
1	B	269	ASP	2.2
1	A	454	PHE	2.1
1	A	344	ASN	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)

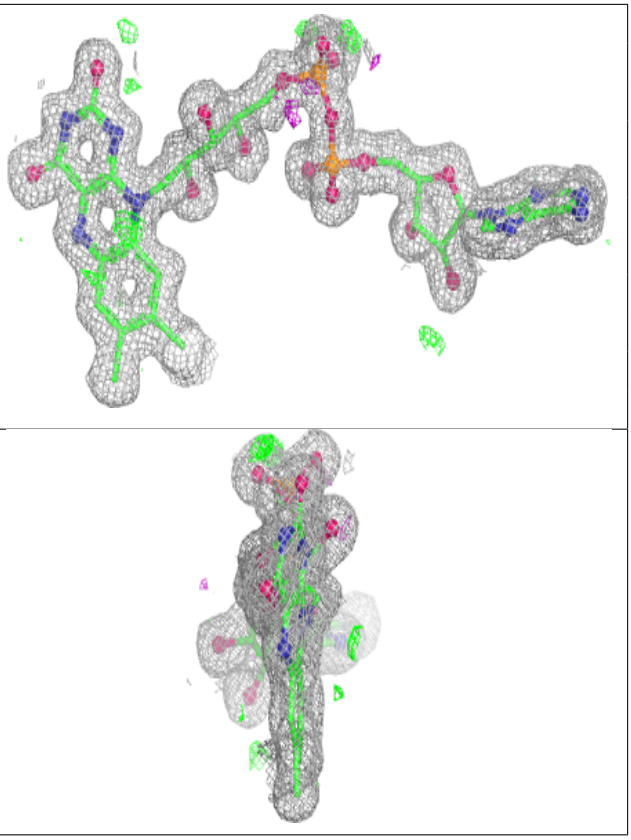
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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	2FG	A	803	12/12	0.82	0.18	32,40,47,51	0
3	2FG	B	802	12/12	0.88	0.11	18,21,23,25	0
3	2FG	A	802	12/12	0.92	0.12	21,23,25,26	0
4	MES	B	803	12/12	0.92	0.17	33,41,51,53	0
2	FDA	A	801	53/53	0.98	0.06	8,10,12,14	0
2	FDA	B	801	53/53	0.98	0.06	9,11,13,16	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.

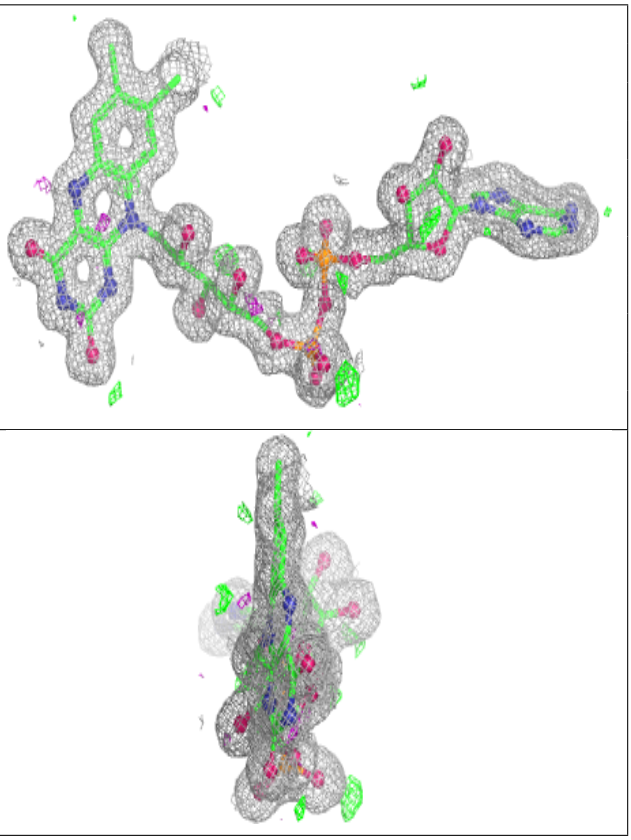
Electron density around FDA A 801:

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



Electron density around FDA B 801:

$2mF_o$-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.