Full wwPDB X-ray Structure Validation Report (i)

Dec 12, 2023 – 04:33 pm GMT

PDB ID	:	3ZT2
Title	:	Small molecule inhibitors of the LEDGF site of HIV type 1 integrase identified by fragment screening and structure based drug design
Authors	:	Peat, T.S.; Newman, J.; Rhodes, D.I.; Vandergraaff, N.; Le, G.; Jones, E.D.; Smith, J.A.; Coates, J.A.V.; Thienthong, N.; Dolezal, O.; Ryan, J.H.; Savage, G.P.; Francis, C.L.; Deadman, J.J.
Deposited on	:	2011-07-01
Resolution	:	1.70 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:

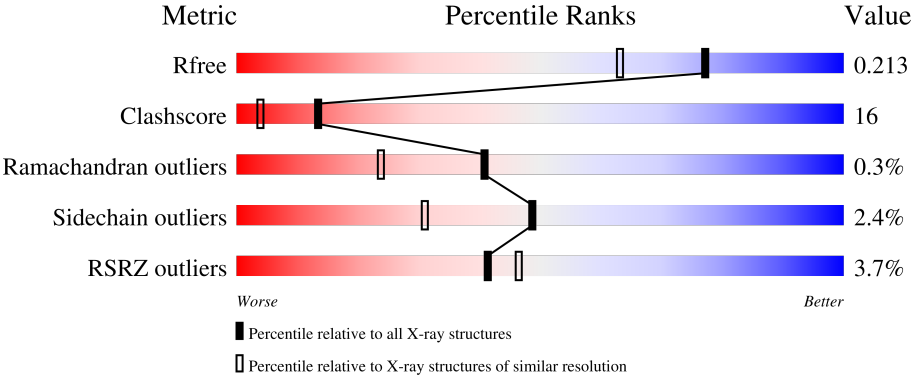
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 1.70 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	4298 (1.70-1.70)
Clashscore	141614	4695 (1.70-1.70)
Ramachandran outliers	138981	4610 (1.70-1.70)
Sidechain outliers	138945	4610 (1.70-1.70)
RSRZ outliers	127900	4222 (1.70-1.70)

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 <=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	167	4% 69% 17% • 11%
1	B	167	2% 67% 20% • 11%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	ACT	A	1213	-	-	X	-
3	ACT	A	1214	-	-	X	-
3	ACT	A	1215	-	-	X	-

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 2671 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 INTEGRASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	149	1195	768	204	219	4	0	7	0
1	B	149	1212	781	206	220	5	0	10	0

There are 26 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	46	MET	-	expression tag	UNP Q76353
A	47	GLY	-	expression tag	UNP Q76353
A	48	SER	-	expression tag	UNP Q76353
A	49	SER	-	expression tag	UNP Q76353
A	50	HIS	-	expression tag	UNP Q76353
A	51	HIS	-	expression tag	UNP Q76353
A	52	HIS	-	expression tag	UNP Q76353
A	53	HIS	-	expression tag	UNP Q76353
A	54	HIS	-	expression tag	UNP Q76353
A	55	HIS	-	expression tag	UNP Q76353
A	56	SER	CYS	engineered mutation	UNP Q76353
A	139	ASP	PHE	engineered mutation	UNP Q76353
A	185	HIS	PHE	engineered mutation	UNP Q76353
B	46	MET	-	expression tag	UNP Q76353
B	47	GLY	-	expression tag	UNP Q76353
B	48	SER	-	expression tag	UNP Q76353
B	49	SER	-	expression tag	UNP Q76353
B	50	HIS	-	expression tag	UNP Q76353
B	51	HIS	-	expression tag	UNP Q76353
B	52	HIS	-	expression tag	UNP Q76353
B	53	HIS	-	expression tag	UNP Q76353
B	54	HIS	-	expression tag	UNP Q76353
B	55	HIS	-	expression tag	UNP Q76353
B	56	SER	CYS	engineered mutation	UNP Q76353
B	139	ASP	PHE	engineered mutation	UNP Q76353

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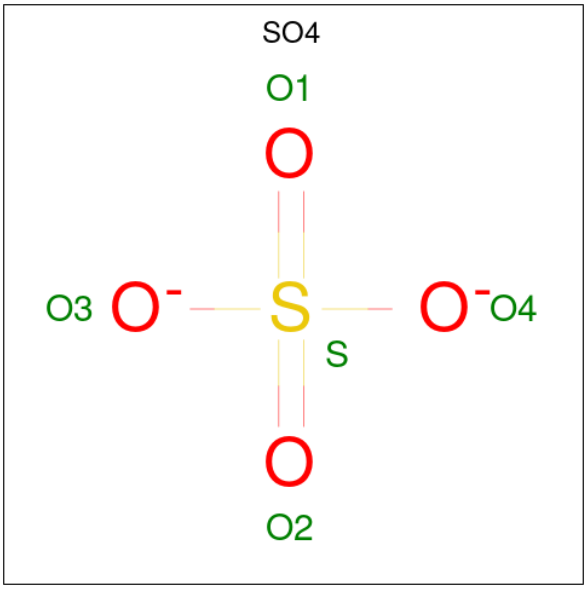
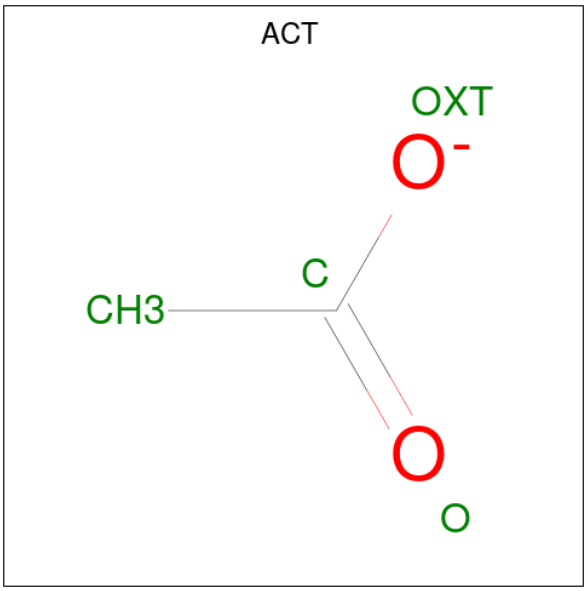
Chain	Residue	Modelled	Actual	Comment	Reference
B	185	HIS	PHE	engineered mutation	UNP Q76353

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O_4S).



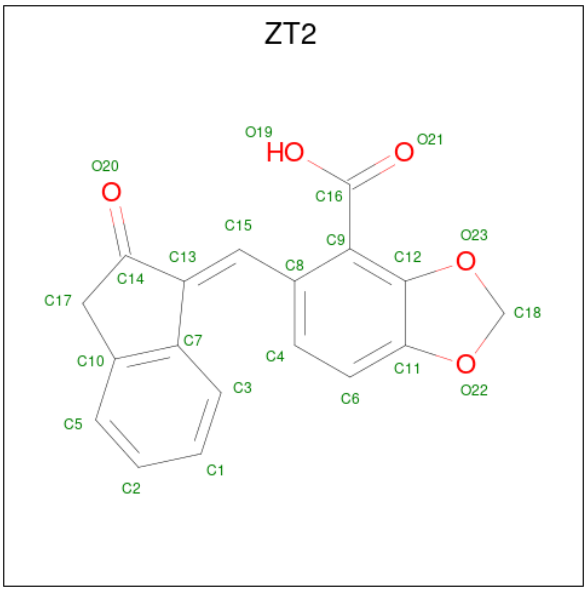
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	O	S		0	0
			5	4	1			
2	A	1	Total	O	S		0	0
			5	4	1			
2	A	1	Total	O	S		0	0
			5	4	1			
2	B	1	Total	O	S		0	0
			5	4	1			
2	B	1	Total	O	S		0	0
			5	4	1			
2	B	1	Total	O	S		0	0
			5	4	1			

- Molecule 3 is ACETATE ION (three-letter code: ACT) (formula: $C_2H_3O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
3	A	1	4	2	2	0	0
			Total	C	O		
3	A	1	4	2	2	0	0
			Total	C	O		
3	A	1	4	2	2	0	0
			Total	C	O		
3	B	1	4	2	2	0	0

- Molecule 4 is 5-[(E)-(2-OXO-2,3-DIHYDRO-1H-INDEN-1-YLIDENE)METHYL]-1,3-BENZODIOXOLE-4-CARBOXYLIC ACID (three-letter code: ZT2) (formula: $C_{18}H_{12}O_5$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
4	A	1	23	18	5	0	0
			Total	C	O		
4	A	1	23	18	5	0	0
			Total	C	O		
4	B	1	23	18	5	0	0
			Total	C	O		
4	B	1	23	18	5	0	0

- Molecule 5 is water.

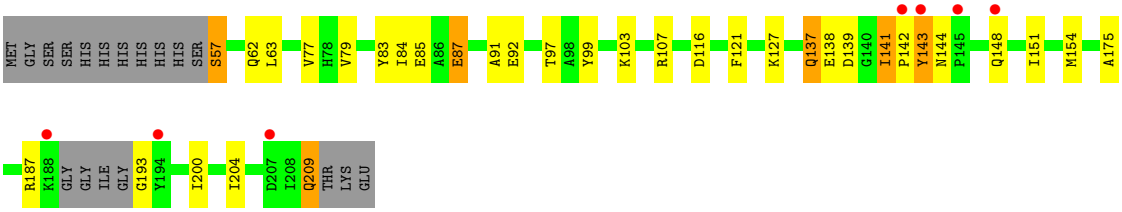
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
5	A	68	68	68	0	0
			Total	O		
5	B	58	58	58	0	0

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.

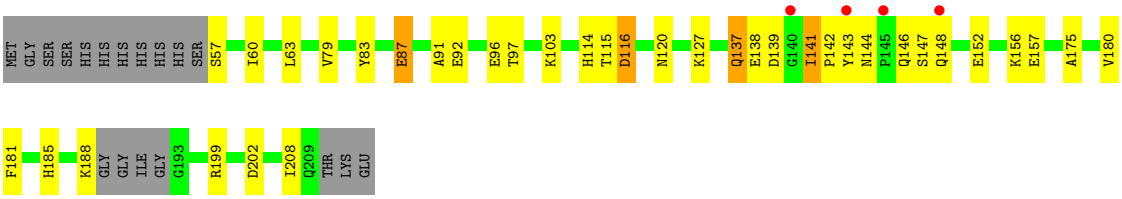
- Molecule 1: INTEGRASE

Chain A:



- Molecule 1: INTEGRASE

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 31	Depositor
Cell constants a, b, c, α, β, γ	71.33Å 71.33Å 66.98Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	45.41 – 1.70 45.41 – 1.70	Depositor EDS
% Data completeness (in resolution range)	98.5 (45.41-1.70) 98.5 (45.41-1.70)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.78 (at 1.70Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.179 , 0.216 0.175 , 0.213	Depositor DCC
R_{free} test set	2070 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å^2)	23.1	Xtriage
Anisotropy	0.016	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 38.3	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.029 for -h,-k,l 0.486 for h,-h-k,-l 0.029 for -k,-h,-l	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	2671	wwPDB-VP
Average B, all atoms (Å^2)	25.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.13% 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: ZT2, ACT, SO4

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	1.49	10/1240 (0.8%)	1.19	2/1680 (0.1%)
1	B	1.43	8/1266 (0.6%)	1.18	3/1713 (0.2%)
All	All	1.46	18/2506 (0.7%)	1.19	5/3393 (0.1%)

All (18) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	83	TYR	CD1-CE1	8.90	1.52	1.39
1	A	87[A]	GLU	CG-CD	7.36	1.62	1.51
1	A	87[B]	GLU	CG-CD	7.36	1.62	1.51
1	B	83	TYR	CD1-CE1	6.45	1.49	1.39
1	A	175	ALA	CA-CB	6.41	1.66	1.52
1	B	87[A]	GLU	CG-CD	6.36	1.61	1.51
1	B	87[B]	GLU	CG-CD	6.36	1.61	1.51
1	B	157	GLU	CG-CD	6.34	1.61	1.51
1	A	79	VAL	CB-CG2	6.21	1.66	1.52
1	B	91	ALA	CA-CB	5.56	1.64	1.52
1	A	85	GLU	CD-OE1	5.48	1.31	1.25
1	A	107	ARG	CZ-NH2	5.30	1.40	1.33
1	B	157	GLU	CB-CG	5.18	1.61	1.52
1	A	138	GLU	CB-CG	5.13	1.61	1.52
1	A	91	ALA	CA-CB	5.08	1.63	1.52
1	B	175	ALA	CA-CB	5.07	1.63	1.52
1	B	79	VAL	CB-CG2	5.07	1.63	1.52
1	A	121	PHE	CD2-CE2	5.04	1.49	1.39

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	87[A]	GLU	OE1-CD-OE2	-5.75	116.40	123.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	87[B]	GLU	OE1-CD-OE2	-5.75	116.40	123.30
1	B	96	GLU	OE1-CD-OE2	-5.55	116.64	123.30
1	B	116	ASP	CB-CG-OD1	5.21	122.98	118.30
1	B	180	VAL	CA-CB-CG2	-5.17	103.14	110.90

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	1195	0	1227	38	0
1	B	1212	0	1257	41	0
2	A	15	0	0	1	0
2	B	15	0	0	0	0
3	A	12	0	9	16	0
3	B	4	0	3	0	0
4	A	46	0	22	2	0
4	B	46	0	22	2	0
5	A	68	0	0	8	0
5	B	58	0	0	2	0
All	All	2671	0	2540	82	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 16.

All (82) 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:103[A]:LYS:HZ3	3:A:1213:ACT:H2	1.19	1.07
1:B:144:ASN:HD21	1:B:146:GLN:HB2	1.18	1.04
1:A:141:ILE:HD12	1:A:142:PRO:CD	1.94	0.97
1:A:141:ILE:CD1	1:A:142:PRO:HD2	1.93	0.96
1:A:62:GLN:NE2	1:A:151:ILE:HD11	1.81	0.94
1:A:103[A]:LYS:NZ	3:A:1213:ACT:H2	1.85	0.92

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:141:ILE:HD12	1:A:142:PRO:HD2	1.53	0.88
1:B:57:SER:N	5:B:2001:HOH:O	2.07	0.87
1:A:141:ILE:HD12	1:A:142:PRO:N	1.90	0.85
3:A:1214:ACT:H1	1:B:103[A]:LYS:NZ	1.93	0.83
1:B:141:ILE:HD13	1:B:142:PRO:N	1.95	0.82
1:A:57:SER:N	5:A:2001:HOH:O	2.13	0.81
1:B:144:ASN:ND2	1:B:146:GLN:HB2	1.96	0.80
1:A:62:GLN:HG3	5:A:2005:HOH:O	1.81	0.79
2:A:1212:SO4:O1	5:A:2044:HOH:O	2.00	0.79
1:B:142:PRO:HG3	1:B:148:GLN:HG3	1.64	0.78
1:A:141:ILE:HD13	1:A:142:PRO:HD2	1.66	0.77
3:A:1214:ACT:H2	5:A:2058:HOH:O	1.86	0.74
1:A:139:ASP:OD1	1:A:141:ILE:HG22	1.88	0.71
3:A:1213:ACT:O	1:B:87[B]:GLU:OE1	2.09	0.70
3:A:1214:ACT:H1	1:B:103[A]:LYS:HZ3	1.61	0.66
1:A:87[B]:GLU:OE1	3:A:1214:ACT:OXT	2.15	0.65
1:A:103[A]:LYS:HB3	3:A:1215:ACT:H2	1.79	0.64
1:B:141:ILE:HD13	1:B:142:PRO:CD	2.29	0.63
1:A:62:GLN:NE2	1:A:151:ILE:CD1	2.60	0.62
3:A:1213:ACT:H1	3:A:1214:ACT:O	1.98	0.62
3:A:1214:ACT:H1	1:B:103[A]:LYS:HZ1	1.63	0.62
3:A:1213:ACT:H3	5:B:2051:HOH:O	1.99	0.62
1:B:181:PHE:O	1:B:185:HIS:HD2	1.83	0.62
1:B:127:LYS:NZ	1:B:137:GLN:HE22	1.97	0.61
1:A:142:PRO:HG3	1:A:148:GLN:HG3	1.80	0.61
1:A:141:ILE:CG2	1:A:143:TYR:CZ	2.83	0.60
1:B:139:ASP:OD1	1:B:141:ILE:HG22	2.01	0.60
1:A:103[B]:LYS:HB3	3:A:1215:ACT:H2	1.83	0.58
1:A:187:ARG:HG3	5:A:2066:HOH:O	2.04	0.57
3:A:1213:ACT:OXT	3:A:1214:ACT:H3	2.04	0.56
4:B:1215:ZT2:O19	4:B:1215:ZT2:O23	2.17	0.56
1:B:141:ILE:HD13	1:B:141:ILE:C	2.26	0.55
1:A:127:LYS:NZ	1:A:137:GLN:HE22	2.04	0.55
1:A:141:ILE:HD12	1:A:141:ILE:C	2.24	0.54
1:B:188:LYS:HG3	1:B:199:ARG:HH12	1.72	0.54
1:A:209:GLN:OE1	1:B:202:ASP:OD1	2.26	0.53
1:A:142:PRO:C	1:A:144:ASN:N	2.63	0.52
3:A:1214:ACT:CH3	1:B:103[A]:LYS:NZ	2.70	0.52
1:B:63[B]:LEU:HD21	1:B:97:THR:HG23	1.91	0.52
1:B:127:LYS:HZ3	1:B:137:GLN:HE22	1.57	0.51
1:B:141:ILE:CG2	1:B:143:TYR:CZ	2.94	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:1214:ACT:CH3	1:B:103[A]:LYS:HZ3	2.24	0.49
1:B:142:PRO:HG3	1:B:148:GLN:CG	2.36	0.49
1:B:142:PRO:HB3	1:B:147:SER:HB2	1.94	0.49
1:A:57:SER:CA	5:A:2001:HOH:O	2.58	0.48
1:B:141:ILE:HG23	1:B:143:TYR:CZ	2.49	0.48
1:A:62:GLN:HE21	1:A:151:ILE:HD11	1.70	0.48
4:B:1215:ZT2:O21	4:B:1215:ZT2:H3	2.15	0.47
1:B:152:GLU:CD	1:B:156[B]:LYS:HZ1	2.18	0.46
1:A:63[B]:LEU:HD21	1:A:97:THR:HG23	1.97	0.46
1:B:141:ILE:C	1:B:141:ILE:CD1	2.84	0.45
1:B:114:HIS:CE1	1:B:138:GLU:OE1	2.69	0.45
1:A:62:GLN:CG	5:A:2005:HOH:O	2.52	0.45
1:A:103[B]:LYS:HE3	1:B:87[B]:GLU:OE2	2.15	0.45
1:B:181:PHE:O	1:B:185:HIS:CD2	2.68	0.45
1:A:77:VAL:HG21	1:A:154:MET:SD	2.57	0.45
1:A:200:ILE:HG12	1:A:204:ILE:HD12	1.99	0.44
1:A:103[B]:LYS:CE	1:B:87[B]:GLU:OE2	2.65	0.44
1:A:87[B]:GLU:OE2	1:B:103[B]:LYS:HE3	2.17	0.44
1:A:87[B]:GLU:OE2	1:B:103[B]:LYS:NZ	2.48	0.43
1:B:142:PRO:C	1:B:144:ASN:N	2.72	0.43
1:A:141:ILE:CG2	1:A:143:TYR:CE1	3.03	0.42
4:A:1217:ZT2:O20	1:B:208:ILE:HD11	2.19	0.42
4:A:1216:ZT2:H3	4:A:1216:ZT2:C4	2.50	0.42
1:A:92:GLU:OE2	1:A:116:ASP:OD2	2.38	0.42
1:A:141:ILE:CD1	1:A:142:PRO:CD	2.65	0.42
3:A:1214:ACT:CH3	1:B:103[B]:LYS:HZ2	2.33	0.42
1:B:92:GLU:OE2	1:B:116:ASP:OD2	2.37	0.41
1:A:77:VAL:HG22	1:A:84:ILE:HG22	2.02	0.41
1:A:99:TYR:CE2	1:A:103[B]:LYS:HD2	2.55	0.41
1:B:152:GLU:CD	1:B:156[B]:LYS:NZ	2.74	0.40
1:B:57:SER:HA	1:B:60:ILE:HD12	2.04	0.40
1:B:115[B]:THR:CG2	1:B:120:ASN:HB3	2.51	0.40
5:A:2033:HOH:O	1:B:185:HIS:HE1	2.05	0.40
1:B:141:ILE:HD13	1:B:142:PRO:HD2	2.04	0.40
1:A:187:ARG:HD3	1:A:193:GLY:O	2.22	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	152/167 (91%)	148 (97%)	3 (2%)	1 (1%)	22 8
1	B	155/167 (93%)	150 (97%)	5 (3%)	0	100 100
All	All	307/334 (92%)	298 (97%)	8 (3%)	1 (0%)	41 24

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	143	TYR

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	130/137 (95%)	126 (97%)	4 (3%)	40 21
1	B	133/137 (97%)	131 (98%)	2 (2%)	65 51
All	All	263/274 (96%)	257 (98%)	6 (2%)	49 33

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	57	SER
1	A	137	GLN
1	A	141	ILE
1	A	209	GLN
1	B	137	GLN

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Mol	Chain	Res	Type
1	B	141	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	62	GLN
1	A	137	GLN
1	A	144	ASN
1	B	137	GLN
1	B	144	ASN
1	B	155	ASN
1	B	185	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)

14 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	$\#\|Z\| > 2$
2	SO4	A	1212	-	4,4,4	0.38	0	6,6,6	1.48	2 (33%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
3	ACT	A	1213	-	3,3,3	1.40	0	3,3,3	0.62	0
3	ACT	A	1215	-	3,3,3	1.23	0	3,3,3	2.47	2 (66%)
4	ZT2	A	1216	-	25,26,26	1.44	3 (12%)	33,38,38	2.00	9 (27%)
3	ACT	A	1214	-	3,3,3	1.96	1 (33%)	3,3,3	1.06	0
4	ZT2	B	1215	-	25,26,26	1.17	2 (8%)	33,38,38	2.64	17 (51%)
2	SO4	B	1212	-	4,4,4	0.38	0	6,6,6	1.40	1 (16%)
3	ACT	B	1213	-	3,3,3	1.31	0	3,3,3	1.63	1 (33%)
4	ZT2	A	1217	-	25,26,26	1.09	1 (4%)	33,38,38	2.78	11 (33%)
2	SO4	A	1211	-	4,4,4	0.47	0	6,6,6	0.73	0
2	SO4	A	1210	-	4,4,4	0.37	0	6,6,6	1.24	1 (16%)
2	SO4	B	1211	-	4,4,4	0.33	0	6,6,6	1.05	0
2	SO4	B	1210	-	4,4,4	0.33	0	6,6,6	1.27	1 (16%)
4	ZT2	B	1214	-	25,26,26	1.35	4 (16%)	33,38,38	1.75	8 (24%)

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
4	ZT2	B	1215	-	-	6/8/26/26	0/4/4/4
4	ZT2	B	1214	-	-	2/8/26/26	0/4/4/4
4	ZT2	A	1216	-	-	2/8/26/26	0/4/4/4
4	ZT2	A	1217	-	-	6/8/26/26	0/4/4/4

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	1216	ZT2	O22-C18	-3.78	1.36	1.43
4	B	1215	ZT2	C9-C8	-3.36	1.37	1.42
3	A	1214	ACT	O-C	2.87	1.35	1.22
4	A	1216	ZT2	O22-C11	-2.82	1.33	1.38
4	B	1215	ZT2	C9-C16	-2.57	1.44	1.50
4	B	1214	ZT2	O21-C16	2.54	1.30	1.22
4	B	1214	ZT2	O22-C11	-2.52	1.34	1.38
4	B	1214	ZT2	O22-C18	-2.51	1.38	1.43
4	A	1217	ZT2	C7-C13	2.17	1.49	1.45
4	B	1214	ZT2	C15-C13	2.14	1.37	1.34
4	A	1216	ZT2	O21-C16	2.08	1.28	1.22

All (53) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	A	1217	ZT2	C4-C8-C15	-7.65	106.27	122.48
4	A	1217	ZT2	C8-C15-C13	7.58	138.21	127.40
4	B	1215	ZT2	C8-C15-C13	6.78	137.07	127.40
4	A	1216	ZT2	C18-O23-C12	-6.32	97.17	105.04
4	B	1215	ZT2	C4-C8-C15	-5.88	110.01	122.48
4	A	1217	ZT2	O22-C11-C12	5.74	114.92	109.63
4	A	1217	ZT2	C18-O22-C11	-5.00	98.85	105.34
4	B	1214	ZT2	C18-O23-C12	-4.99	98.82	105.04
4	B	1215	ZT2	C18-O23-C12	-4.51	99.41	105.04
4	A	1216	ZT2	O23-C18-O22	4.51	115.28	108.08
4	B	1215	ZT2	O19-C16-O21	4.09	132.42	123.35
4	A	1217	ZT2	C6-C4-C8	3.75	126.82	121.74
4	B	1214	ZT2	O23-C12-C9	-3.73	124.27	128.43
4	A	1217	ZT2	O23-C18-O22	3.62	113.86	108.08
4	B	1215	ZT2	C18-O22-C11	-3.48	100.82	105.34
4	A	1216	ZT2	O23-C12-C9	-3.45	124.59	128.43
3	A	1215	ACT	OXT-C-O	3.40	134.57	122.05
4	B	1214	ZT2	O23-C18-O22	3.33	113.40	108.08
4	B	1215	ZT2	O23-C12-C9	-3.14	124.93	128.43
4	B	1215	ZT2	O23-C18-O22	3.06	112.97	108.08
4	B	1214	ZT2	O23-C12-C11	2.96	113.04	109.78
4	B	1215	ZT2	O23-C12-C11	2.77	112.83	109.78
4	A	1216	ZT2	C4-C6-C11	-2.68	114.95	120.06
4	B	1215	ZT2	C15-C13-C14	-2.66	115.67	125.99
4	A	1217	ZT2	O19-C16-O21	2.65	129.22	123.35
2	B	1212	SO4	O3-S-O1	2.64	123.10	109.31
4	A	1216	ZT2	C18-O22-C11	-2.63	101.93	105.34
2	B	1210	SO4	O3-S-O1	2.59	122.85	109.31
3	A	1215	ACT	O-C-CH3	-2.50	112.60	122.33
4	A	1216	ZT2	O23-C12-C11	2.48	112.51	109.78
2	A	1210	SO4	O3-S-O2	2.45	122.09	109.31
4	B	1215	ZT2	C12-C9-C16	-2.39	111.51	120.69
4	B	1215	ZT2	C8-C9-C16	2.38	128.88	123.34
4	A	1216	ZT2	C8-C15-C13	-2.36	124.03	127.40
4	A	1217	ZT2	O21-C16-C9	-2.32	115.44	121.16
3	B	1213	ACT	OXT-C-O	2.31	130.57	122.05
4	B	1214	ZT2	C8-C15-C13	-2.31	124.11	127.40
4	B	1215	ZT2	C17-C10-C7	2.29	113.06	110.22
4	B	1215	ZT2	C2-C1-C3	-2.26	116.75	120.19
4	A	1217	ZT2	C3-C7-C13	-2.24	129.71	133.78
4	A	1216	ZT2	C17-C10-C7	2.23	113.00	110.22
4	B	1215	ZT2	C3-C7-C13	-2.23	129.73	133.78

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	B	1214	ZT2	C3-C7-C10	-2.22	117.97	120.81
4	B	1215	ZT2	C1-C2-C5	2.21	123.56	120.19
4	A	1217	ZT2	C4-C6-C11	-2.19	115.88	120.06
4	B	1214	ZT2	C4-C6-C11	-2.19	115.88	120.06
2	A	1212	SO4	O3-S-O1	-2.17	97.96	109.31
2	A	1212	SO4	O3-S-O2	2.16	120.60	109.31
4	A	1217	ZT2	C15-C13-C14	-2.13	117.72	125.99
4	B	1214	ZT2	C15-C13-C14	-2.10	117.85	125.99
4	B	1215	ZT2	C2-C5-C10	-2.09	117.77	120.89
4	B	1215	ZT2	O21-C16-C9	-2.05	116.11	121.16
4	A	1216	ZT2	C15-C13-C14	-2.02	118.16	125.99

There are no chirality outliers.

All (16) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	1217	ZT2	C13-C15-C8-C4
4	B	1215	ZT2	C13-C15-C8-C4
4	B	1215	ZT2	O21-C16-C9-C12
4	B	1215	ZT2	O19-C16-C9-C12
4	A	1217	ZT2	O19-C16-C9-C8
4	A	1217	ZT2	C13-C15-C8-C9
4	B	1215	ZT2	C13-C15-C8-C9
4	A	1217	ZT2	O21-C16-C9-C12
4	B	1215	ZT2	O19-C16-C9-C8
4	A	1216	ZT2	O19-C16-C9-C12
4	B	1214	ZT2	O19-C16-C9-C12
4	A	1217	ZT2	O21-C16-C9-C8
4	A	1216	ZT2	O21-C16-C9-C12
4	B	1214	ZT2	O21-C16-C9-C12
4	B	1215	ZT2	O21-C16-C9-C8
4	A	1217	ZT2	O19-C16-C9-C12

There are no ring outliers.

7 monomers are involved in 21 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1212	SO4	1	0
3	A	1213	ACT	6	0
3	A	1215	ACT	2	0
4	A	1216	ZT2	1	0

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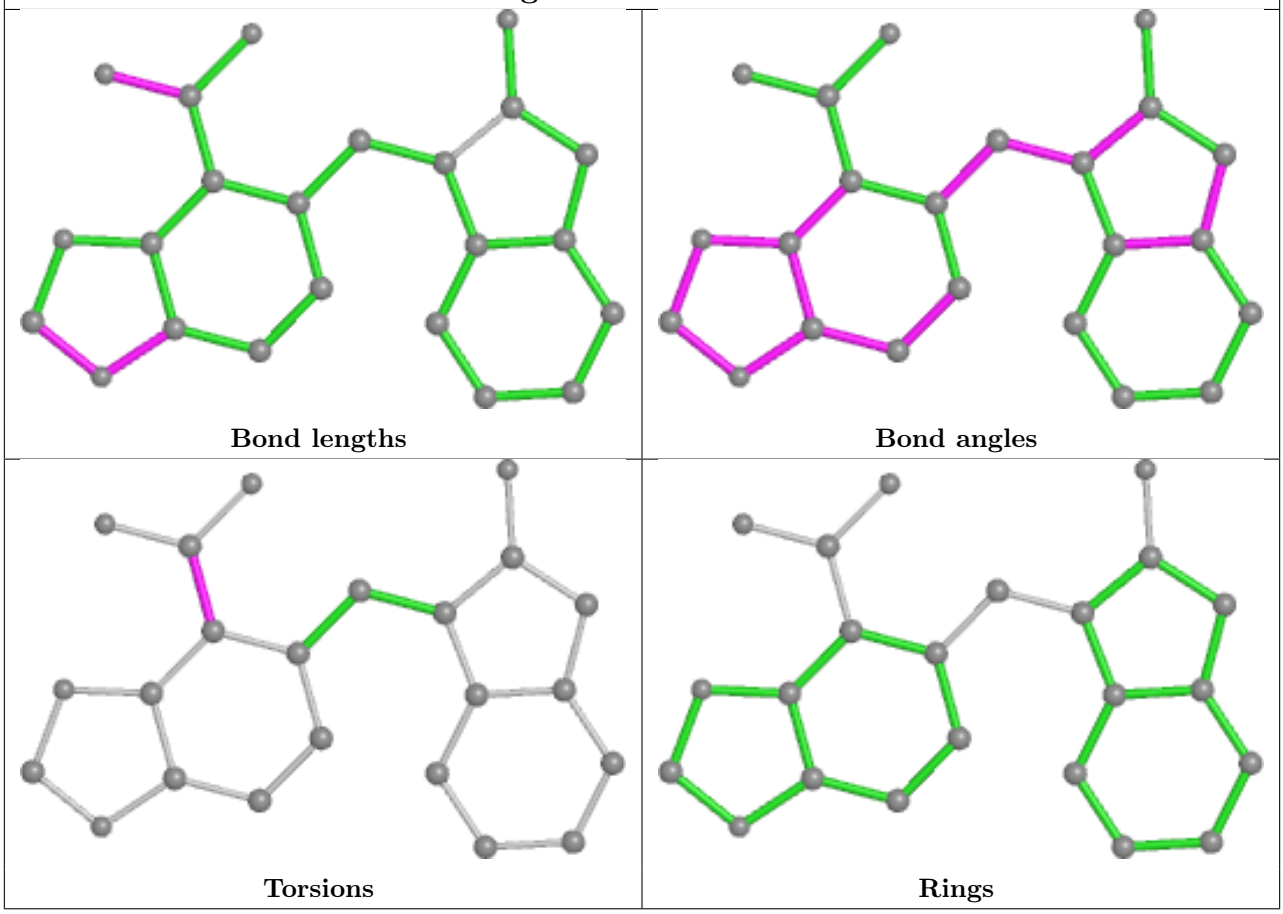
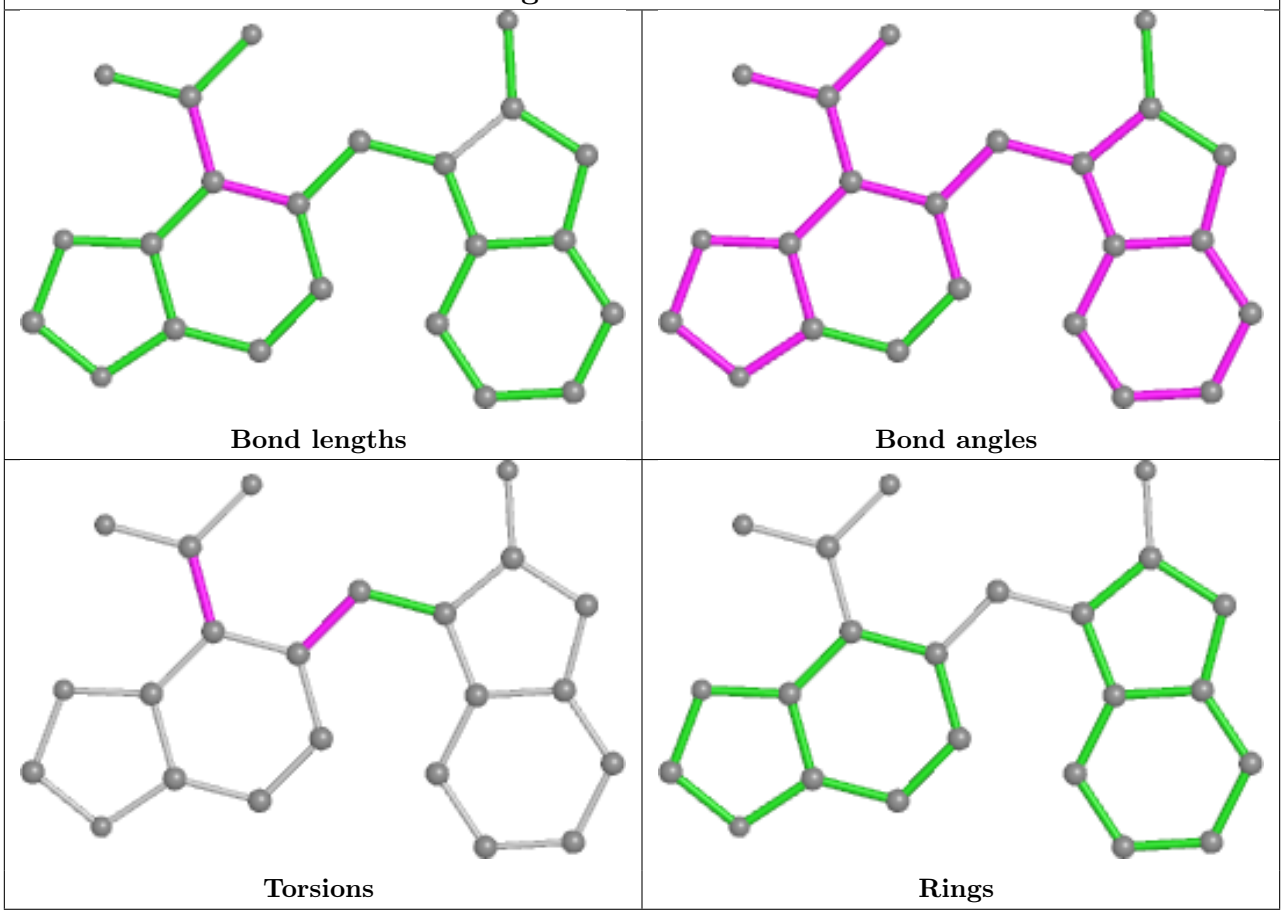
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1214	ACT	10	0
4	B	1215	ZT2	2	0
4	A	1217	ZT2	1	0

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.

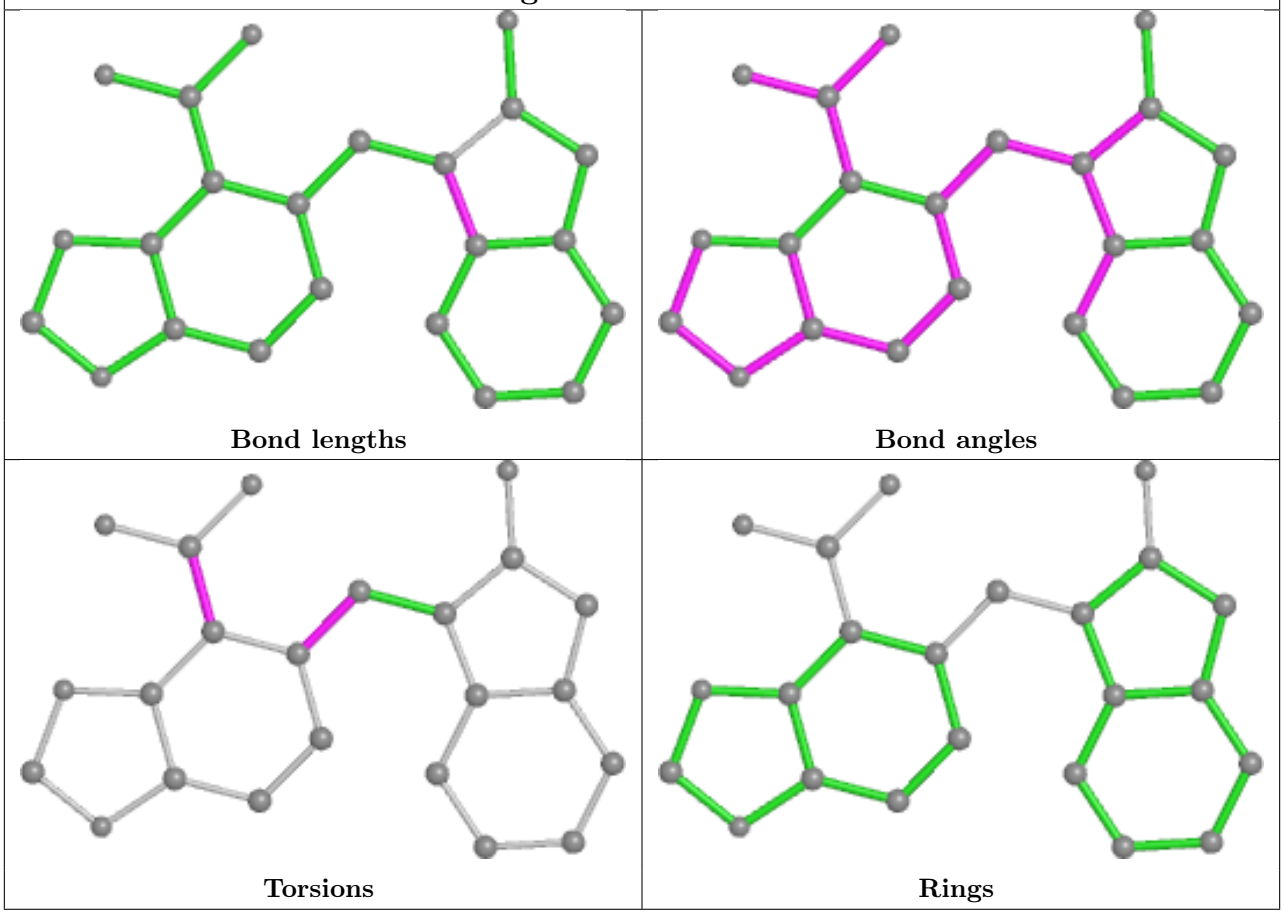
Ligand ZT2 A 1216



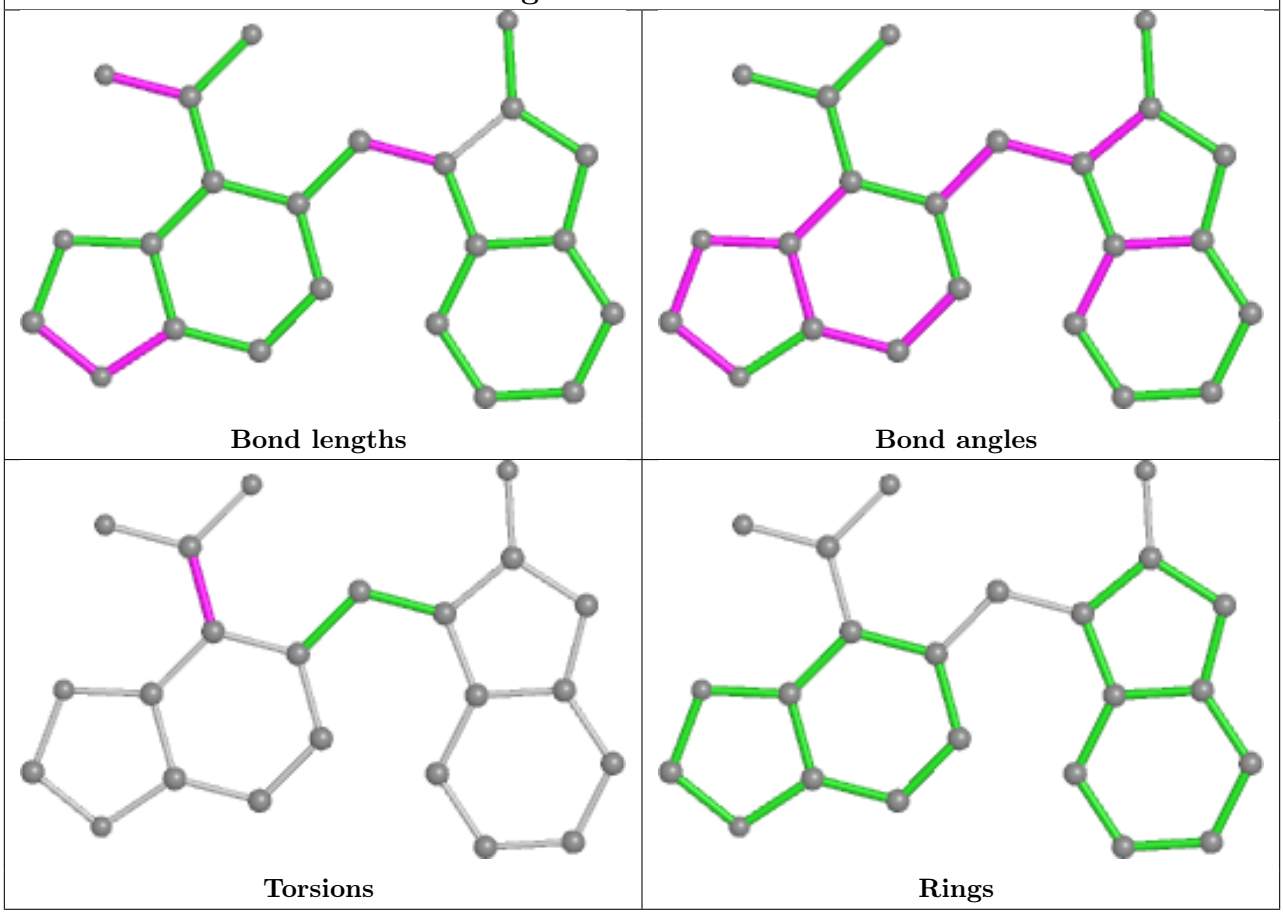
Ligand ZT2 B 1215



Ligand ZT2 A 1217



Ligand ZT2 B 1214



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	149/167 (89%)	-0.37	7 (4%)	31	35	13, 21, 47, 66	27 (18%)
1	B	149/167 (89%)	-0.36	4 (2%)	54	58	13, 20, 54, 69	23 (15%)
All	All	298/334 (89%)	-0.36	11 (3%)	41	46	13, 21, 54, 69	50 (16%)

All (11) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	148	GLN	5.6
1	A	143	TYR	5.3
1	B	148	GLN	5.0
1	B	143	TYR	4.8
1	B	145	PRO	3.6
1	B	140	GLY	3.0
1	A	188	LYS	2.9
1	A	194	TYR	2.5
1	A	145	PRO	2.2
1	A	207	ASP	2.2
1	A	142	PRO	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)

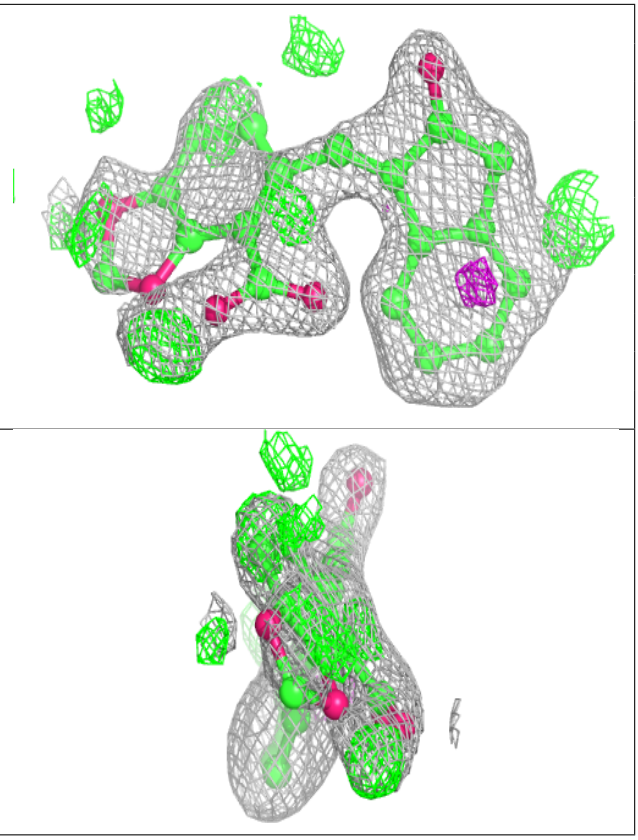
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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	ZT2	B	1215	23/23	0.74	0.18	28,37,48,49	13
4	ZT2	A	1217	23/23	0.75	0.21	29,39,52,54	12
3	ACT	A	1215	4/4	0.86	0.11	28,28,30,31	4
3	ACT	B	1213	4/4	0.87	0.12	25,27,29,32	4
3	ACT	A	1213	4/4	0.97	0.10	22,26,27,27	0
3	ACT	A	1214	4/4	0.97	0.09	22,26,26,28	0
2	SO4	B	1212	5/5	0.97	0.12	24,27,31,31	5
4	ZT2	B	1214	23/23	0.98	0.06	15,20,25,30	0
4	ZT2	A	1216	23/23	0.98	0.06	15,20,25,29	0
2	SO4	B	1211	5/5	0.99	0.10	22,26,30,32	5
2	SO4	A	1210	5/5	0.99	0.09	25,26,30,34	5
2	SO4	A	1211	5/5	0.99	0.12	20,24,25,31	5
2	SO4	A	1212	5/5	0.99	0.12	24,28,31,31	5
2	SO4	B	1210	5/5	0.99	0.07	26,27,30,35	5

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.

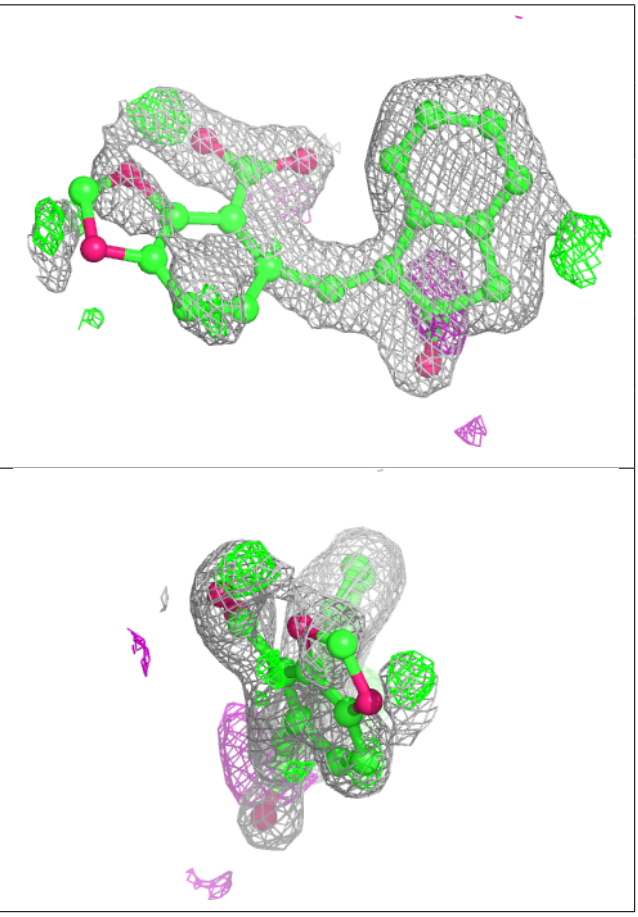
Electron density around ZT2 B 1215:

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



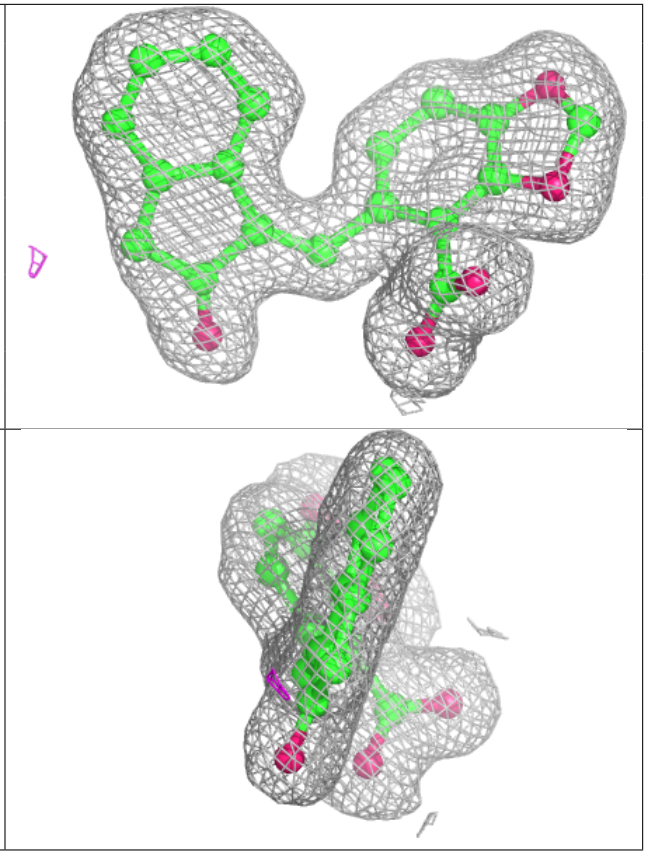
Electron density around ZT2 A 1217:

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



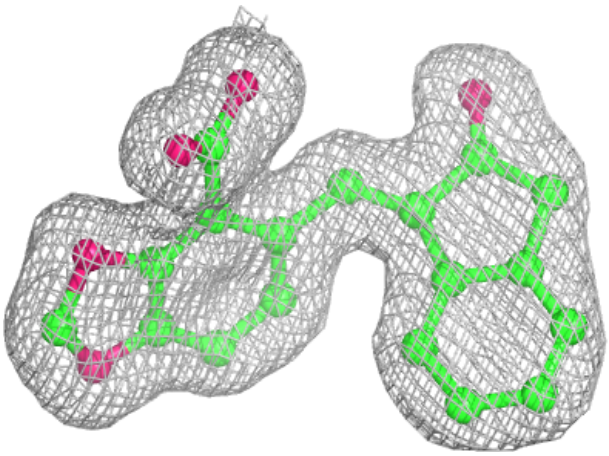
Electron density around ZT2 B 1214:

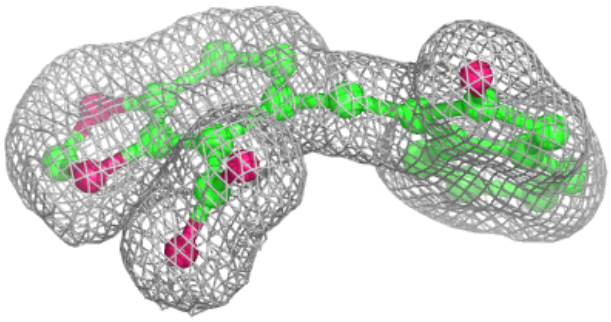
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

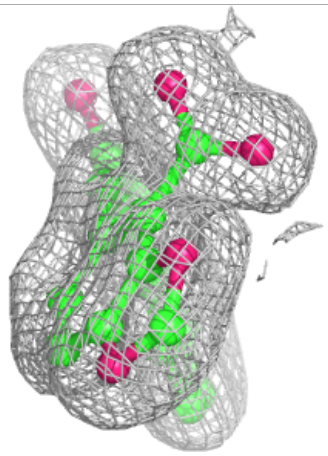


Electron density around ZT2 A 1216:

$2mF_o$-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.