Full wwPDB X-ray Structure Validation Report ⓘ

Oct 12, 2021 – 05:33 pm BST

PDB ID	:	7OEM
Title	:	Crystal structure of the human METTL3-METTL14 complex with compound UOZ120
Authors	:	Bedi, R.K.; Huang, D.; Caflisch, A.
Deposited on	:	2021-05-03
Resolution	:	2.20 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the ⓘ symbol.

The following versions of software and data (see references ⓘ) were used in the production of this report:

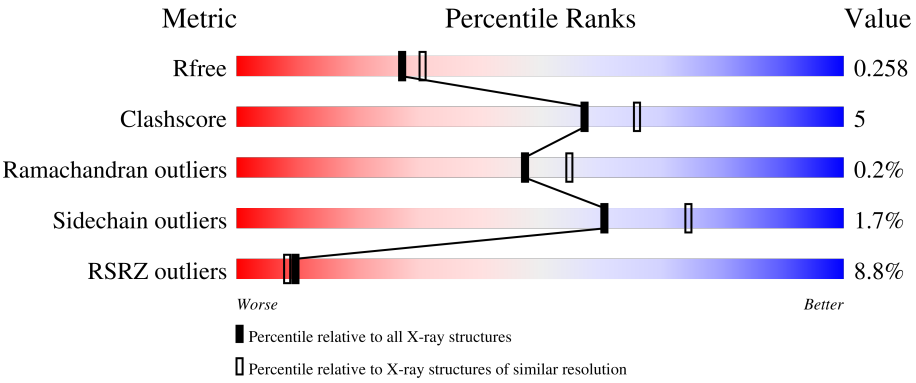
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.23.2
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0267
CCP4	:	7.1.010 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.23.2

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 2.20 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	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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	246	7% 73% 8% 19%
2	B	290	8% 74% 8% · 17%

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 3640 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 N6-adenosine-methyltransferase catalytic subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	199	Total	C	N	O	S	0	0	0
			1552	995	271	277	9			

There are 19 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	335	MET	-	initiating methionine	UNP Q86U44
A	336	GLY	-	expression tag	UNP Q86U44
A	337	HIS	-	expression tag	UNP Q86U44
A	338	HIS	-	expression tag	UNP Q86U44
A	339	HIS	-	expression tag	UNP Q86U44
A	340	HIS	-	expression tag	UNP Q86U44
A	341	HIS	-	expression tag	UNP Q86U44
A	342	HIS	-	expression tag	UNP Q86U44
A	343	SER	-	expression tag	UNP Q86U44
A	344	SER	-	expression tag	UNP Q86U44
A	345	GLY	-	expression tag	UNP Q86U44
A	346	ARG	-	expression tag	UNP Q86U44
A	347	GLU	-	expression tag	UNP Q86U44
A	348	ASN	-	expression tag	UNP Q86U44
A	349	LEU	-	expression tag	UNP Q86U44
A	350	TYR	-	expression tag	UNP Q86U44
A	351	PHE	-	expression tag	UNP Q86U44
A	352	GLN	-	expression tag	UNP Q86U44
A	353	GLY	-	expression tag	UNP Q86U44

- Molecule 2 is a protein called N6-adenosine-methyltransferase non-catalytic subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	242	Total	C	N	O	S	0	1	0
			1872	1201	317	341	13			

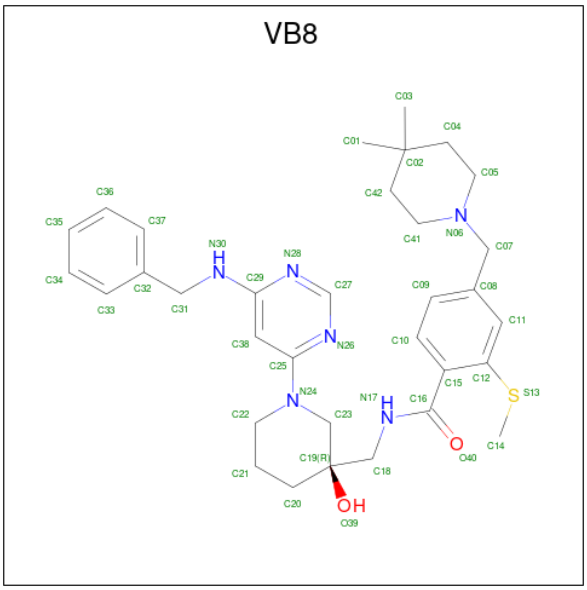
There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	106	MET	-	initiating methionine	UNP Q9HCE5

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

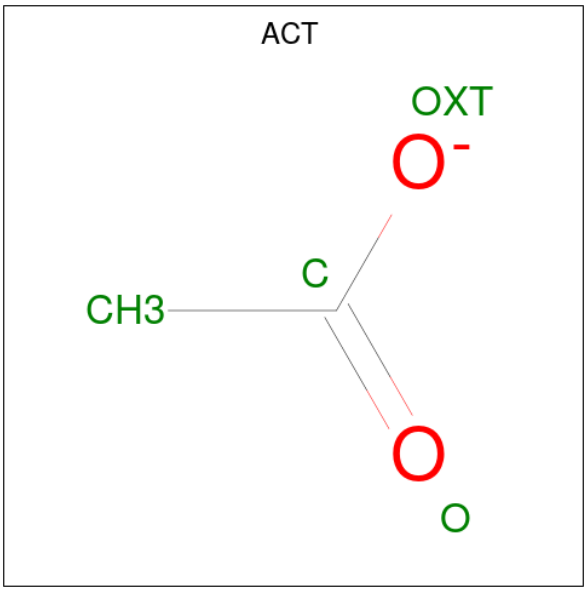
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	2	Total Mg 2 2	0	0
3	B	2	Total Mg 2 2	0	0

- Molecule 4 is 4-[(4,4-dimethylpiperidin-1-yl)methyl]-2-methylsulfanyl- {N}-[[(3 {R})-3-oxidanyl-1-[6-[(phenylmethyl)amino]pyrimidin-4-yl]piperidin-3-yl]methyl]benzamide (three-letter code: VB8) (formula: $C_{33}H_{44}N_6O_2S$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C N O S 42 33 6 2 1	0	0

- Molecule 5 is ACETATE ION (three-letter code: ACT) (formula: $C_2H_3O_2$).



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

- Molecule 6 is water.

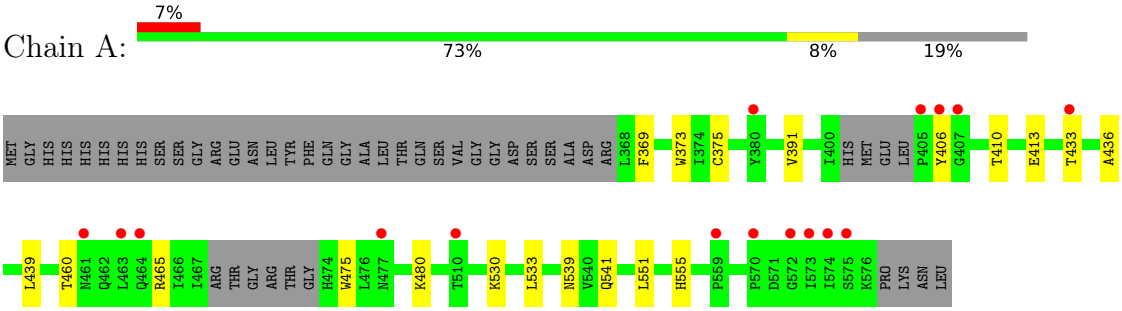
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	62	Total O 62 62	0	0
6	B	104	Total O 104 104	0	0

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.

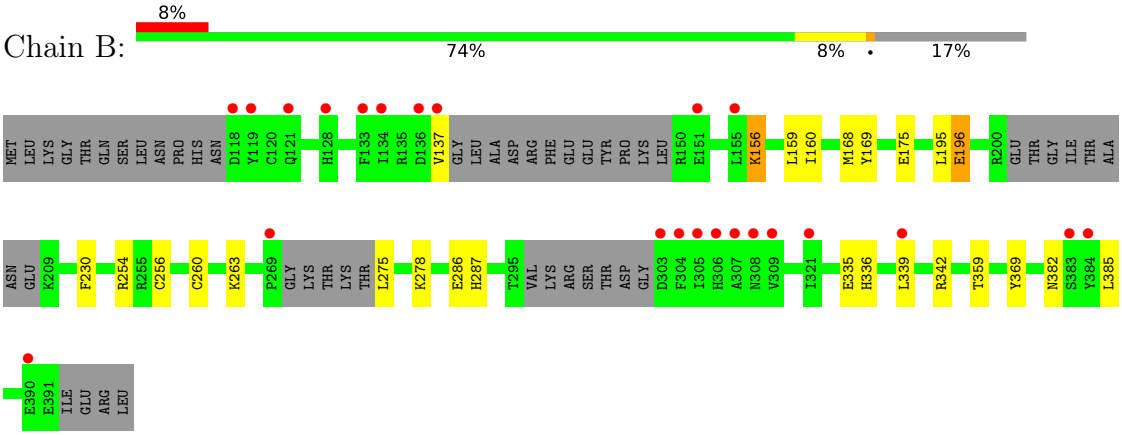
• Molecule 1: N6-adenosine-methyltransferase catalytic subunit

Chain A:



• Molecule 2: N6-adenosine-methyltransferase non-catalytic subunit

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α, β, γ	63.94Å 63.94Å 226.66Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	44.66 – 2.20 44.66 – 2.20	Depositor EDS
% Data completeness (in resolution range)	99.8 (44.66-2.20) 99.8 (44.66-2.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.49 (at 2.20Å)	Xtriage
Refinement program	PHENIX 1.19.1_4122	Depositor
R, R_{free}	0.207 , 0.258 0.205 , 0.258	Depositor DCC
R_{free} test set	1413 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	43.7	Xtriage
Anisotropy	0.034	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	(Not available) , (Not available)	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.035 for -h,-k,l	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	3640	wwPDB-VP
Average B, all atoms (Å^2)	46.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.05% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MG, VB8, ACT

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	0.40	0/1592	0.60	0/2169
2	B	0.43	0/1918	0.63	0/2609
All	All	0.42	0/3510	0.62	0/4778

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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	1552	0	1467	14	0
2	B	1872	0	1733	20	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
4	A	42	0	0	2	0
5	B	4	0	3	0	0
6	A	62	0	0	6	1
6	B	104	0	0	7	0
All	All	3640	0	3203	33	1

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 5.

All (33) 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)
4:A:603:VB8:S13	4:A:603:VB8:N17	2.51	0.83
2:B:196:GLU:OE2	6:B:501:HOH:O	1.98	0.81
2:B:382:ASN:O	6:B:502:HOH:O	2.01	0.77
1:A:391:VAL:HB	1:A:530:LYS:HG2	1.67	0.75
1:A:410:THR:HG23	1:A:413:GLU:H	1.56	0.70
4:A:603:VB8:O40	6:A:701:HOH:O	2.15	0.63
2:B:168:MET:HE3	2:B:369:TYR:HA	1.81	0.63
1:A:555:HIS:HD2	6:A:753:HOH:O	1.83	0.60
2:B:195:LEU:HB3	6:B:501:HOH:O	2.03	0.59
1:A:373:TRP:HB2	1:A:551:LEU:HD13	1.85	0.57
2:B:275:LEU:N	6:B:507:HOH:O	2.39	0.55
2:B:156:LYS:O	2:B:160:ILE:HG13	2.06	0.55
1:A:436:ALA:HA	1:A:439:LEU:HB3	1.92	0.51
1:A:555:HIS:HE1	6:A:746:HOH:O	1.92	0.51
1:A:433:THR:HG23	6:A:752:HOH:O	2.11	0.51
2:B:230:PHE:CE1	2:B:339:LEU:HD22	2.45	0.51
2:B:137:VAL:N	6:B:509:HOH:O	2.45	0.50
2:B:156:LYS:HE2	2:B:336:HIS:O	2.13	0.48
1:A:475:TRP:HD1	2:B:256:CYS:HG	1.58	0.47
2:B:175:GLU:OE1	2:B:175:GLU:N	2.43	0.47
2:B:385:LEU:HB3	6:B:576:HOH:O	2.14	0.47
1:A:539:ASN:O	1:A:541:GLN:HG2	2.14	0.47
2:B:263:LYS:HE2	2:B:286:GLU:HG3	1.95	0.47
2:B:342:ARG:NE	6:B:512:HOH:O	2.48	0.46
2:B:160:ILE:HD13	2:B:335:GLU:HB3	1.98	0.45
2:B:260[B]:CYS:SG	2:B:287:HIS:CE1	3.10	0.45
2:B:169:TYR:HA	2:B:359:THR:O	2.18	0.44
1:A:460:THR:HA	1:A:465:ARG:O	2.18	0.43
1:A:480:LYS:HE2	2:B:260[B]:CYS:SG	2.60	0.42
1:A:375:CYS:SG	6:A:704:HOH:O	2.62	0.41
1:A:475:TRP:HD1	2:B:256:CYS:SG	2.43	0.40
1:A:555:HIS:CD2	6:A:753:HOH:O	2.66	0.40
2:B:159:LEU:HD23	2:B:159:LEU:HA	1.85	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
6:A:705:HOH:O	6:A:710:HOH:O[5_665]	2.17	0.03

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	193/246 (78%)	187 (97%)	5 (3%)	1 (0%)	29 31
2	B	233/290 (80%)	225 (97%)	8 (3%)	0	100 100
All	All	426/536 (80%)	412 (97%)	13 (3%)	1 (0%)	47 55

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	406	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	159/215 (74%)	157 (99%)	2 (1%)	69 81
2	B	188/259 (73%)	184 (98%)	4 (2%)	53 67
All	All	347/474 (73%)	341 (98%)	6 (2%)	60 74

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

Mol	Chain	Res	Type
1	A	369	PHE
1	A	533	LEU
2	B	156	LYS
2	B	196	GLU
2	B	254	ARG

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Mol	Chain	Res	Type
2	B	278	LYS

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

Mol	Chain	Res	Type
1	A	538	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 6 ligands modelled in this entry, 4 are monoatomic - leaving 2 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	$\#\|Z\| > 2$
5	ACT	B	403	-	1,3,3	8.11	1 (100%)	0,3,3	-	-
4	VB8	A	603	-	44,46,46	3.46	13 (29%)	58,65,65	1.69	7 (12%)

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	VB8	A	603	-	-	3/25/49/49	0/5/5/5

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	603	VB8	C07-N06	-10.38	1.27	1.47
4	A	603	VB8	C20-C19	-8.89	1.44	1.52
5	B	403	ACT	CH3-C	8.11	1.59	1.48
4	A	603	VB8	C23-N24	7.91	1.53	1.46
4	A	603	VB8	C29-N30	7.88	1.47	1.36
4	A	603	VB8	C16-N17	6.98	1.49	1.33
4	A	603	VB8	C04-C02	-6.59	1.43	1.53
4	A	603	VB8	C42-C02	-5.46	1.44	1.53
4	A	603	VB8	C25-N24	4.74	1.47	1.37
4	A	603	VB8	C15-C16	3.84	1.58	1.50
4	A	603	VB8	C22-N24	2.80	1.51	1.46
4	A	603	VB8	C20-C21	-2.71	1.45	1.52
4	A	603	VB8	C18-N17	2.31	1.51	1.45
4	A	603	VB8	O40-C16	-2.12	1.19	1.23

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	A	603	VB8	C27-N26-C25	5.31	119.58	114.94
4	A	603	VB8	N28-C27-N26	-4.57	121.45	128.60
4	A	603	VB8	C08-C07-N06	-3.96	105.45	113.12
4	A	603	VB8	C20-C19-C23	3.69	113.97	109.78
4	A	603	VB8	C04-C05-N06	3.52	114.71	111.23
4	A	603	VB8	C38-C29-N28	-2.71	118.97	122.75
4	A	603	VB8	C38-C25-N24	-2.04	119.87	122.29

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	603	VB8	C15-C12-S13-C14
4	A	603	VB8	C11-C12-S13-C14
4	A	603	VB8	N17-C18-C19-O39

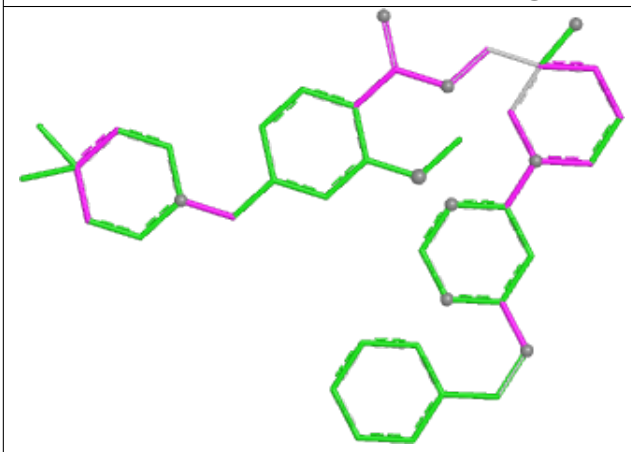
There are no ring outliers.

1 monomer is involved in 2 short contacts:

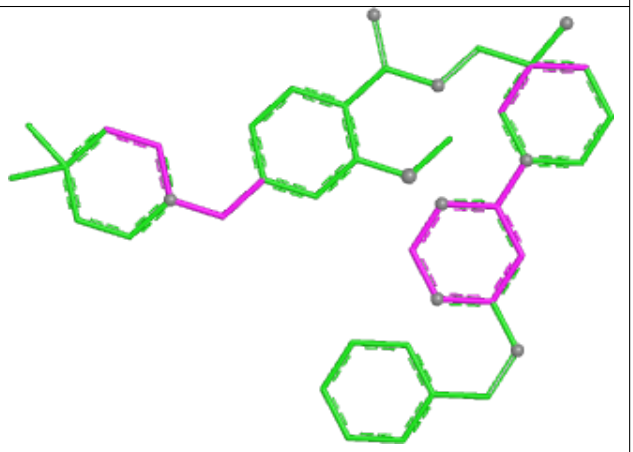
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	603	VB8	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less 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.

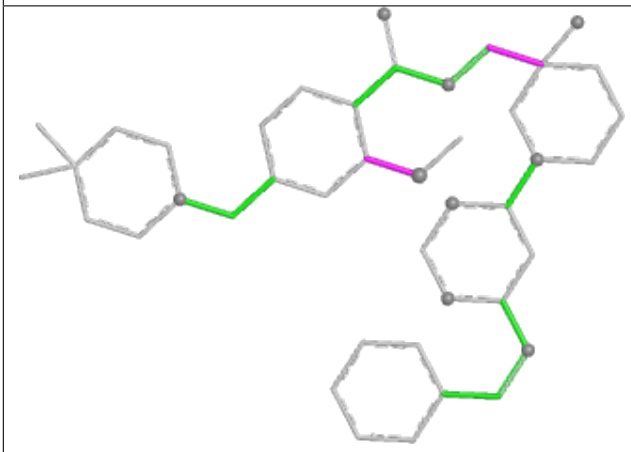
Ligand VB8 A 603



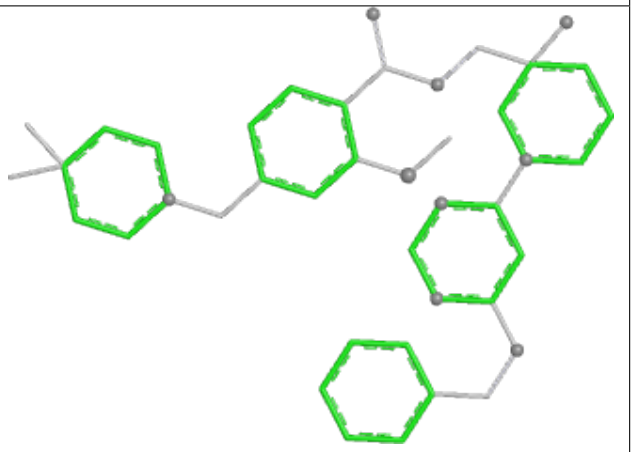
Bond lengths



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

6.1 Protein, DNA and RNA chains

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95^{th} 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	199/246 (80%)	0.39	16 (8%) 12 11	32, 46, 71, 88	0
2	B	242/290 (83%)	0.58	23 (9%) 8 7	27, 41, 75, 89	0
All	All	441/536 (82%)	0.49	39 (8%) 10 8	27, 44, 74, 89	0

All (39) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	305	ILE	5.9
1	A	574	ILE	5.0
2	B	307	ALA	4.8
2	B	133	PHE	4.6
2	B	137	VAL	4.3
2	B	155	LEU	4.2
2	B	136	ASP	4.1
2	B	303	ASP	3.8
2	B	269	PRO	3.8
1	A	464	GLN	3.7
2	B	306	HIS	3.7
1	A	570	PRO	3.7
1	A	510	THR	3.7
1	A	572	GLY	3.4
2	B	304	PHE	3.2
2	B	321	ILE	3.2
2	B	128	HIS	3.1
2	B	390	GLU	3.1
2	B	384	TYR	3.0
1	A	405	PRO	3.0
2	B	119	TYR	2.9
2	B	339	LEU	2.8
1	A	406	TYR	2.8
1	A	575	SER	2.7

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Mol	Chain	Res	Type	RSRZ
2	B	121	GLN	2.7
2	B	309	VAL	2.7
1	A	461	ASN	2.6
2	B	151	GLU	2.6
1	A	407	GLY	2.4
1	A	463	LEU	2.4
1	A	433	THR	2.4
2	B	118	ASP	2.3
1	A	477	ASN	2.3
2	B	383	SER	2.3
1	A	380	TYR	2.3
2	B	308	ASN	2.2
1	A	559	PRO	2.2
2	B	134	ILE	2.2
1	A	573	ILE	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, 95^{th} 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.

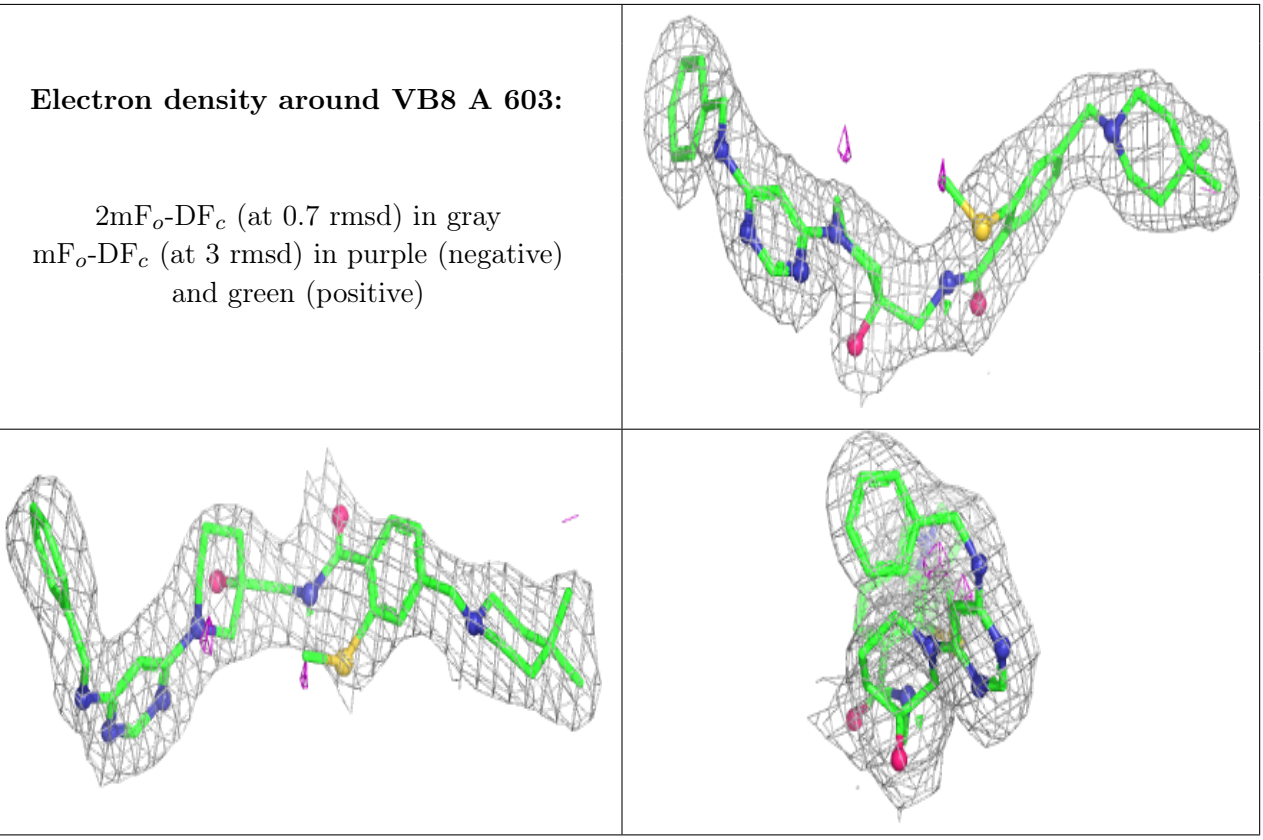
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	MG	B	402	1/1	0.73	0.24	58,58,58,58	0
3	MG	A	602	1/1	0.84	0.27	43,43,43,43	0
3	MG	A	601	1/1	0.88	0.18	46,46,46,46	0
4	VB8	A	603	42/42	0.89	0.18	40,53,65,97	0
3	MG	B	401	1/1	0.95	0.31	29,29,29,29	0
5	ACT	B	403	4/4	0.95	0.17	35,36,37,50	0

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 VB8 A 603:

$2mF_o$-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.