



Full wwPDB X-ray Structure Validation Report ⓘ

Sep 7, 2021 – 10:58 am BST

PDB ID : 7O0M
Title : Crystal structure of the human METTL3-METTL14 complex bound to Compound 9 (ADO_AD_023)
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Deposited on : 2021-03-26
Resolution : 2.39 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 : 2.23.1
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) : 2.23.1

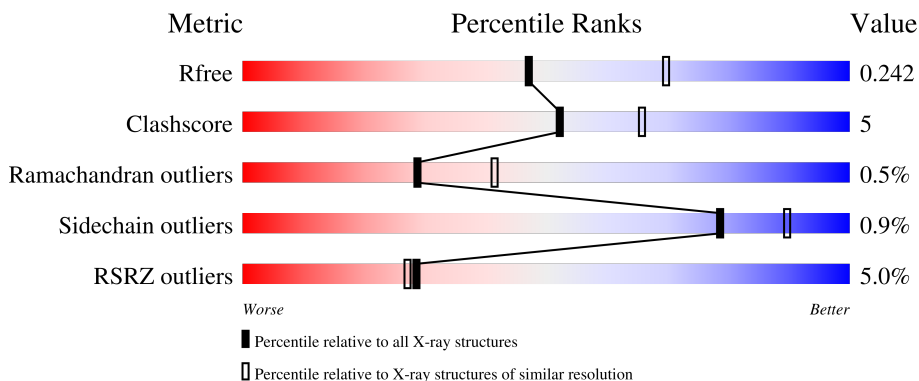
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.39 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	3907 (2.40-2.40)
Clashscore	141614	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)
RSRZ outliers	127900	3811 (2.40-2.40)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	246	
2	B	290	

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
4	ACT	B	401	-	-	X	-

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 3541 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
			Total	C	N	O	S			
1	A	196	1537	986	268	274	9	0	0	0

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

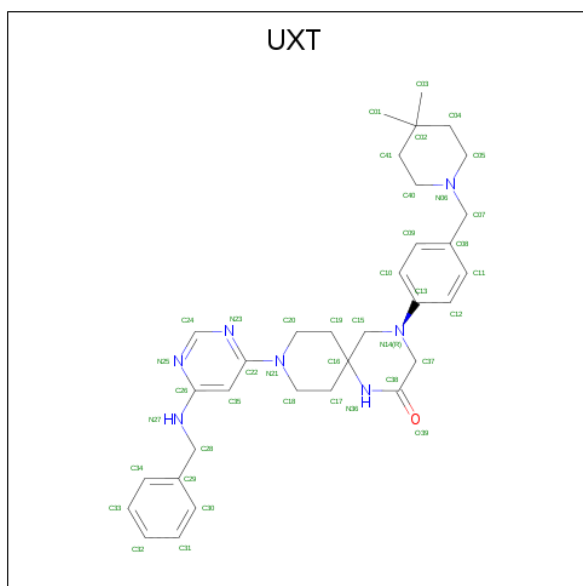
- Molecule 2 is a protein called N6-adenosine-methyltransferase non-catalytic subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	240	1846	1186	314	334	12	0	1	0

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 4-[4-[(4,4-dimethylpiperidin-1-yl)methyl]phenyl]-9-[6-[(phenylmethyl)amino]pyrimidin-4-yl]-1,4,9-triazaspiro[5.5]undecan-2-one (three-letter code: UXT) (formula: C₃₃H₄₃N₇O) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
3	A	1	41	33	7	1	0	0

- Molecule 4 is ACETATE ION (three-letter code: ACT) (formula: C₂H₃O₂).



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

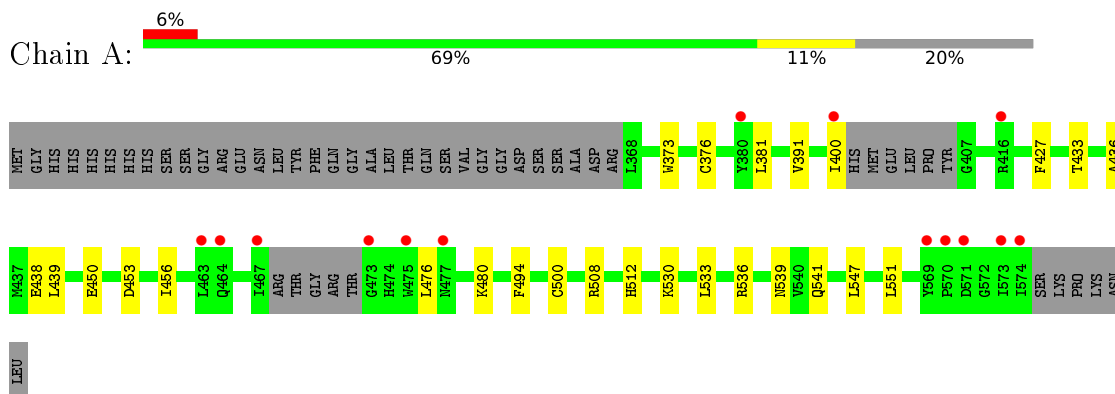
- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	34	Total O 34 34	0	0
5	B	79	Total O 79 79	0	0

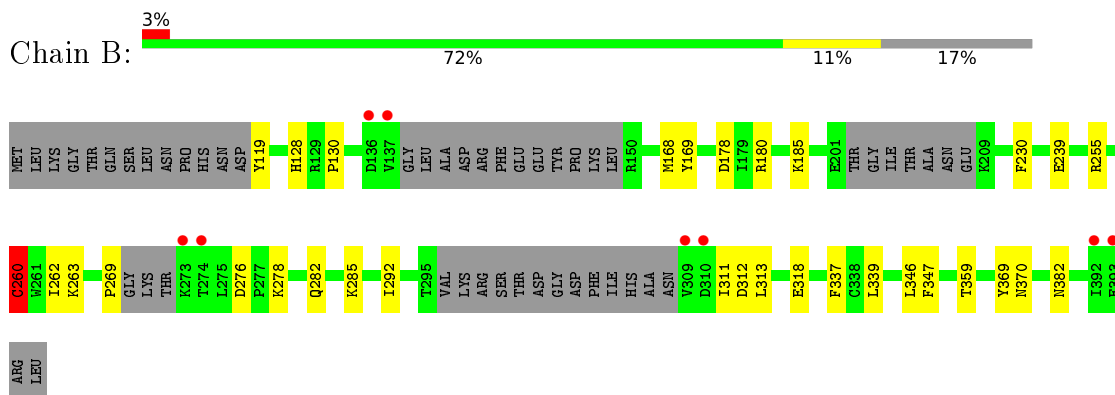
3 Residue-property plots [i](#)

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



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



4 Data and refinement statistics

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α , β , γ	64.07Å 64.07Å 225.08Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	44.61 – 2.39 44.61 – 2.39	Depositor EDS
% Data completeness (in resolution range)	99.8 (44.61-2.39) 99.8 (44.61-2.39)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.61 (at 2.39Å)	Xtrriage
Refinement program	PHENIX 1.19.1_4122	Depositor
R, R_{free}	0.197 , 0.248 0.196 , 0.242	Depositor DCC
R_{free} test set	1100 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	48.9	Xtrriage
Anisotropy	0.104	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 47.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.033 for -h,-k,l	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	3541	wwPDB-VP
Average B, all atoms (Å ²)	50.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.24% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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

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	0/1576	0.65	0/2146
2	B	0.47	1/1896 (0.1%)	0.64	0/2580
All	All	0.44	1/3472 (0.0%)	0.64	0/4726

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	260	CYS	CB-SG	-6.03	1.72	1.82

There are no bond angle outliers.

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	1537	0	1468	20	0
2	B	1846	0	1697	24	0
3	A	41	0	0	0	0
4	B	4	0	3	2	0
5	A	34	0	0	0	0
5	B	79	0	0	5	0
All	All	3541	0	3168	36	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 5.

All (36) 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)
2:B:168:MET:HE3	2:B:369:TYR:HA	1.58	0.85
2:B:255:ARG:HB2	4:B:401:ACT:H3	1.67	0.76
2:B:178:ASP:OD1	5:B:501:HOH:O	2.10	0.69
2:B:382:ASN:O	5:B:502:HOH:O	2.14	0.66
1:A:373:TRP:HB2	1:A:551:LEU:HD13	1.78	0.65
1:A:480:LYS:HE2	2:B:260:CYS:HB2	1.80	0.64
2:B:185:LYS:NZ	5:B:504:HOH:O	2.27	0.64
1:A:450:GLU:OE2	2:B:278:LYS:NZ	2.31	0.61
2:B:230:PHE:CE2	2:B:292:ILE:HD12	2.38	0.59
1:A:533:LEU:HD21	1:A:547:LEU:HD12	1.87	0.56
2:B:119:TYR:N	5:B:507:HOH:O	2.38	0.56
1:A:391:VAL:HB	1:A:530:LYS:HG2	1.85	0.56
1:A:456:ILE:HG23	2:B:285:LYS:HE2	1.91	0.52
1:A:456:ILE:HD13	2:B:260:CYS:SG	2.51	0.51
2:B:263:LYS:HD3	2:B:318:GLU:HG3	1.92	0.51
1:A:456:ILE:HD11	2:B:262:ILE:HD11	1.94	0.50
1:A:539:ASN:O	1:A:541:GLN:HG2	2.12	0.50
2:B:230:PHE:CZ	2:B:339:LEU:HD22	2.47	0.49
2:B:169:TYR:HA	2:B:359:THR:O	2.14	0.47
2:B:168:MET:HE1	2:B:370:ASN:H	1.79	0.47
1:A:512:HIS:HD2	1:A:536:ARG:NH2	2.11	0.47
2:B:311:ILE:HG23	2:B:313:LEU:H	1.80	0.46
1:A:376:CYS:SG	1:A:381:LEU:HD22	2.55	0.46
1:A:436:ALA:HA	1:A:439:LEU:HB3	1.97	0.46
1:A:533:LEU:HD23	1:A:533:LEU:HA	1.77	0.45
1:A:400:ILE:HD13	1:A:433:THR:HG23	1.98	0.44
2:B:239:GLU:HG2	5:B:562:HOH:O	2.17	0.44
1:A:533:LEU:CD2	1:A:547:LEU:HD12	2.48	0.43
1:A:500:CYS:SG	2:B:130:PRO:HD2	2.58	0.43
1:A:476:LEU:HD13	2:B:312:ASP:HA	2.01	0.42
1:A:427:PHE:HE2	1:A:494:PHE:CD2	2.38	0.41
1:A:476:LEU:HG	2:B:337:PHE:HZ	1.85	0.41
2:B:128:HIS:NE2	2:B:269:PRO:HG3	2.35	0.41
2:B:346:LEU:O	2:B:347:PHE:HB2	2.21	0.41
1:A:438:GLU:HG2	4:B:401:ACT:OXT	2.21	0.41
2:B:276:ASP:OD1	2:B:278:LYS:N	2.49	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	190/246 (77%)	182 (96%)	7 (4%)	1 (0%)	29	41
2	B	231/290 (80%)	223 (96%)	7 (3%)	1 (0%)	34	48
All	All	421/536 (78%)	405 (96%)	14 (3%)	2 (0%)	29	41

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	508	ARG
2	B	180	ARG

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	160/215 (74%)	159 (99%)	1 (1%)	86	94
2	B	183/259 (71%)	181 (99%)	2 (1%)	73	87
All	All	343/474 (72%)	340 (99%)	3 (1%)	78	90

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	453	ASP
2	B	260	CYS
2	B	282	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	477	ASN
1	A	512	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](#)

2 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	$\# Z > 2$
4	ACT	B	401	-	1,3,3	8.67	1 (100%)	0,3,3	0.00	-
3	UXT	A	601	-	45,46,46	2.57	11 (24%)	55,66,66	2.49	16 (29%)

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	UXT	A	601	-	-	0/17/55/55	0/5/6/6

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	401	ACT	CH3-C	8.67	1.59	1.48
3	A	601	UXT	C26-N27	7.88	1.47	1.36
3	A	601	UXT	C07-N06	-7.57	1.32	1.47
3	A	601	UXT	C38-N36	6.70	1.43	1.34
3	A	601	UXT	C05-N06	-5.02	1.33	1.46
3	A	601	UXT	C40-N06	-4.87	1.33	1.46
3	A	601	UXT	C22-N21	4.19	1.46	1.37
3	A	601	UXT	C18-N21	-3.69	1.40	1.46
3	A	601	UXT	C20-N21	-3.14	1.41	1.46
3	A	601	UXT	C15-N14	2.87	1.48	1.46
3	A	601	UXT	C13-N14	2.58	1.45	1.38
3	A	601	UXT	C17-C16	2.03	1.57	1.54

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	601	UXT	C17-C16-C15	9.36	128.28	110.62
3	A	601	UXT	N25-C24-N23	-5.19	120.49	128.60
3	A	601	UXT	C24-N23-C22	4.78	119.12	114.94
3	A	601	UXT	C41-C40-N06	4.50	115.68	111.23
3	A	601	UXT	C19-C16-C15	-4.26	102.58	110.62
3	A	601	UXT	C37-N14-C15	4.25	119.35	112.61
3	A	601	UXT	C04-C05-N06	4.23	115.41	111.23
3	A	601	UXT	C19-C16-C17	3.98	112.56	108.84
3	A	601	UXT	C08-C07-N06	-3.74	105.86	113.12
3	A	601	UXT	C18-N21-C20	3.73	119.75	111.52
3	A	601	UXT	C03-C02-C41	-3.09	105.40	110.05
3	A	601	UXT	C01-C02-C04	-3.03	105.49	110.05
3	A	601	UXT	C19-C20-N21	2.67	115.08	110.34
3	A	601	UXT	C35-C26-N25	-2.62	119.09	122.75
3	A	601	UXT	C07-N06-C40	-2.61	105.26	111.06
3	A	601	UXT	C41-C02-C04	2.16	111.67	108.71

There are no chirality outliers.

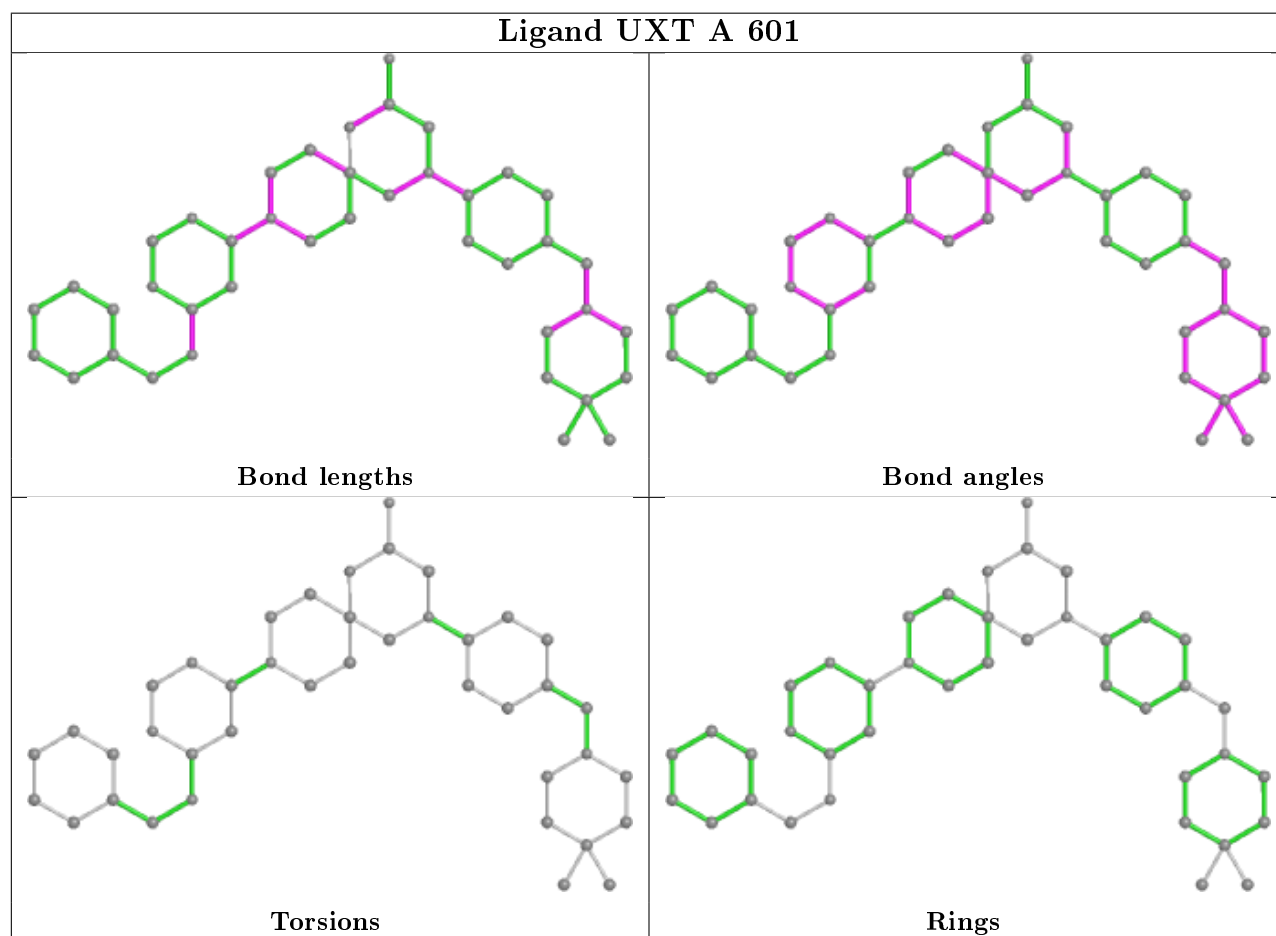
There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	401	ACT	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 than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



5.7 Other polymers [\(i\)](#)

There are no such residues in this entry.

5.8 Polymer linkage issues

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, 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	196/246 (79%)	0.13	14 (7%) 16 14	34, 51, 78, 88	0
2	B	240/290 (82%)	0.13	8 (3%) 46 45	30, 45, 79, 92	0
All	All	436/536 (81%)	0.13	22 (5%) 28 27	30, 48, 78, 92	0

All (22) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	392	ILE	5.1
1	A	571	ASP	3.8
1	A	574	ILE	3.7
1	A	570	PRO	3.6
2	B	309	VAL	3.5
2	B	310	ASP	3.4
1	A	467	ILE	2.9
2	B	136	ASP	2.8
2	B	137	VAL	2.7
1	A	573	ILE	2.6
1	A	463	LEU	2.5
1	A	416	ARG	2.4
1	A	475	TRP	2.4
1	A	464	GLN	2.4
1	A	473	GLY	2.4
1	A	477	ASN	2.3
1	A	380	TYR	2.2
1	A	569	TYR	2.2
2	B	393	GLU	2.2
2	B	274	THR	2.2
1	A	400	ILE	2.1
2	B	273	LYS	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(\AA^2)	Q<0.9
3	UXT	A	601	41/41	0.88	0.19	49,56,61,66	0
4	ACT	B	401	4/4	0.95	0.14	39,43,45,47	0

6.5 Other polymers [i](#)

There are no such residues in this entry.