



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 13, 2026 – 06:19 PM UTC

PDB ID : 9J5C / pdb_00009j5c
Title : ESTS1 phthalate ester degrading esterase from *Sulfobacillus acidophilus* in complex with diethylhexyl phthalate
Authors : Verma, S.; Kumar, P.
Deposited on : 2024-08-11
Resolution : 2.70 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 ⓘ 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 ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : **FAILED**
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

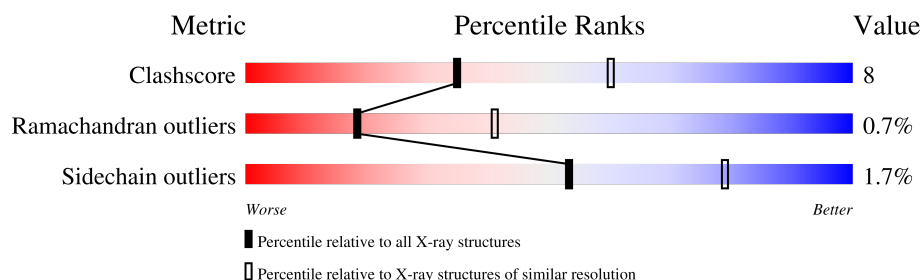
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 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))
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)

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 $\leq 5\%$.

Note EDS failed to run properly.

Mol	Chain	Length	Quality of chain
1	A	310	

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 4813 atoms, of which 2357 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.

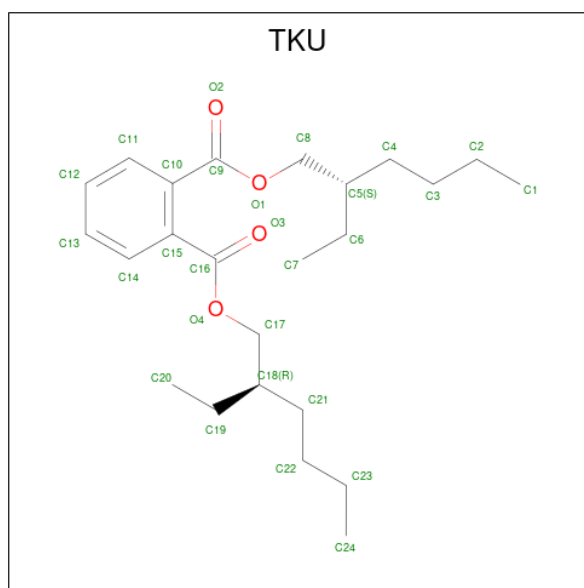
- Molecule 1 is a protein called Alpha/beta hydrolase fold-3 domain-containing protein.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	296	4597	1483	2281	396	426	11	124	5	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-5	HIS	-	expression tag	UNP G8TV28
A	-4	HIS	-	expression tag	UNP G8TV28
A	-3	HIS	-	expression tag	UNP G8TV28
A	-2	HIS	-	expression tag	UNP G8TV28
A	-1	HIS	-	expression tag	UNP G8TV28
A	0	HIS	-	expression tag	UNP G8TV28

- Molecule 2 is {O}1-[(2 {R})-2-ethylhexyl] {O}2-[(2 {S})-2-ethylhexyl] benzene-1,2-dicarboxylate (CCD ID: TKU) (formula: C₂₄H₃₈O₄) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	H	O	0	0
			66	24	38	4		
2	A	1	Total	C	H	O	0	0
			66	24	38	4		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	84	Total	O	0	0
			84	84		

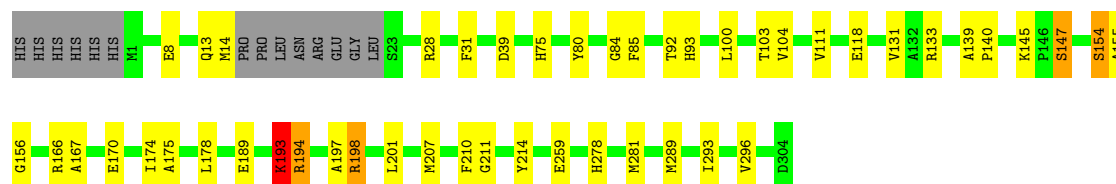
3 Residue-property plots [i](#)

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. 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. 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.

Note EDS failed to run properly.

- Molecule 1: Alpha/beta hydrolase fold-3 domain-containing protein

Chain A: 



4 Data and refinement statistics

EDS failed to run properly - this section is therefore incomplete.

Property	Value	Source
Space group	P 63	Depositor
Cell constants a, b, c, α , β , γ	108.26Å 108.26Å 44.87Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	23.45 – 2.70	Depositor
% Data completeness (in resolution range)	99.8 (23.45-2.70)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.06 (at 2.71Å)	Xtriage
Refinement program	REFMAC 5.8.0352	Depositor
R, R_{free}	0.214 , 0.294	Depositor
Wilson B-factor (Å ²)	-37.6	Xtriage
Anisotropy	-0.029	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.28$	Xtriage
Estimated twinning fraction	0.095 for h,-h-k,-l	Xtriage
Total number of atoms	4813	wwPDB-VP
Average B, all atoms (Å ²)	1.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.59% 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: TKU

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	0.53	0/2395	0.93	2/3268 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	4

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	193	LYS	O-C-N	-5.81	114.86	122.59
1	A	39	ASP	CA-CB-CG	5.67	118.27	112.60

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	166	ARG	Sidechain
1	A	193	LYS	Peptide,Mainchain

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	2316	2281	2278	33	0
2	A	56	76	0	10	0
3	A	84	0	0	0	0
All	All	2456	2357	2278	35	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 8.

All (35) 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:189:GLU:OE2	1:A:194[A]:ARG:NH2	2.22	0.71
2:A:401:TKU:C8	2:A:401:TKU:C11	2.68	0.70
2:A:401:TKU:C14	2:A:401:TKU:C17	2.74	0.65
1:A:259[A]:GLU:HA	1:A:259[A]:GLU:OE1	1.98	0.62
1:A:154:SER:OG	1:A:155:ALA:N	2.30	0.60
1:A:207:MET:HA	2:A:401:TKU:C12	2.33	0.59
1:A:154:SER:OG	2:A:401:TKU:O4	2.18	0.58
1:A:92:THR:HG22	1:A:93:HIS:ND1	2.22	0.54
1:A:197:ALA:HB3	1:A:198:ARG:HE	1.77	0.49
1:A:31:PHE:HE1	1:A:92:THR:HG21	1.77	0.48
1:A:100:LEU:O	1:A:104:VAL:HB	2.14	0.48
1:A:210:PHE:CD2	2:A:401:TKU:C12	2.96	0.48
1:A:154:SER:OG	2:A:401:TKU:C16	2.62	0.48
1:A:92:THR:HG22	1:A:93:HIS:HD1	1.79	0.48
1:A:75:HIS:CE1	1:A:145:LYS:HD2	2.50	0.47
1:A:167:ALA:HB2	1:A:174:ILE:HD12	1.96	0.47
1:A:214:TYR:HD1	2:A:401:TKU:C1	2.29	0.46
1:A:84:GLY:O	1:A:85:PHE:HB2	2.16	0.46
1:A:133:ARG:NH1	1:A:170:GLU:O	2.49	0.46
1:A:281:MET:O	1:A:289:MET:HE3	2.17	0.45
1:A:103:THR:HG21	1:A:293:ILE:HG22	1.98	0.44
1:A:207:MET:HG2	2:A:401:TKU:C12	2.47	0.44
1:A:13:GLN:O	1:A:14:MET:HB2	2.20	0.42
1:A:80:TYR:O	1:A:156:GLY:HA3	2.18	0.42
1:A:139:ALA:HB3	1:A:140:PRO:HD3	2.01	0.42
1:A:201:LEU:HD23	1:A:278:HIS:O	2.20	0.42
1:A:154:SER:HG	2:A:401:TKU:C17	2.32	0.41
1:A:211:GLY:HA2	2:A:401:TKU:C2	2.50	0.41
1:A:147[A]:SER:HB2	1:A:175:ALA:HB2	2.03	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:28:ARG:NH1	1:A:118:GLU:OE2	2.50	0.41
1:A:154:SER:HB2	1:A:278:HIS:NE2	2.35	0.41
1:A:178:LEU:HD13	1:A:296:VAL:HG13	2.02	0.41
1:A:111:VAL:HG22	1:A:131:VAL:HG11	2.02	0.41
1:A:147[B]:SER:HB3	1:A:175:ALA:HB2	2.02	0.41

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	297/310 (96%)	285 (96%)	9 (3%)	3 (1%)	12 32

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	193	LYS
1	A	194[A]	ARG
1	A	194[B]	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	243/251 (97%)	238 (98%)	5 (2%)	47 75

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	8	GLU
1	A	147[A]	SER
1	A	147[B]	SER
1	A	154	SER
1	A	198	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 oligosaccharides 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	$\# Z > 2$
2	TKU	A	402	-	28,28,28	0.37	0	34,34,34	1.03	4 (11%)
2	TKU	A	401	-	28,28,28	0.51	0	34,34,34	1.28	4 (11%)

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
2	TKU	A	402	-	-	10/30/30/30	0/1/1/1
2	TKU	A	401	-	-	11/30/30/30	0/1/1/1

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	401	TKU	C17-O4-C16	4.20	123.69	116.45
2	A	401	TKU	C8-O1-C9	3.33	122.18	116.45
2	A	402	TKU	C14-C15-C16	-2.92	112.75	118.66
2	A	402	TKU	C10-C15-C16	2.84	128.18	122.39
2	A	401	TKU	C15-C10-C9	2.43	127.35	122.39
2	A	401	TKU	C11-C10-C9	-2.35	113.90	118.66
2	A	402	TKU	C15-C10-C9	2.29	127.07	122.39
2	A	402	TKU	C11-C10-C9	-2.07	114.46	118.66

There are no chirality outliers.

All (21) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	402	TKU	O4-C17-C18-C19
2	A	401	TKU	O2-C9-O1-C8
2	A	401	TKU	C10-C9-O1-C8
2	A	401	TKU	C15-C16-O4-C17
2	A	401	TKU	O3-C16-O4-C17
2	A	401	TKU	O4-C17-C18-C19
2	A	402	TKU	C10-C9-O1-C8
2	A	402	TKU	C18-C21-C22-C23
2	A	402	TKU	C4-C5-C8-O1
2	A	402	TKU	C6-C5-C8-O1
2	A	402	TKU	C17-C18-C21-C22
2	A	402	TKU	O4-C17-C18-C21
2	A	401	TKU	O4-C17-C18-C21
2	A	401	TKU	C17-C18-C21-C22
2	A	402	TKU	C8-C5-C6-C7
2	A	401	TKU	C3-C4-C5-C6
2	A	401	TKU	C19-C18-C21-C22
2	A	401	TKU	C3-C4-C5-C8

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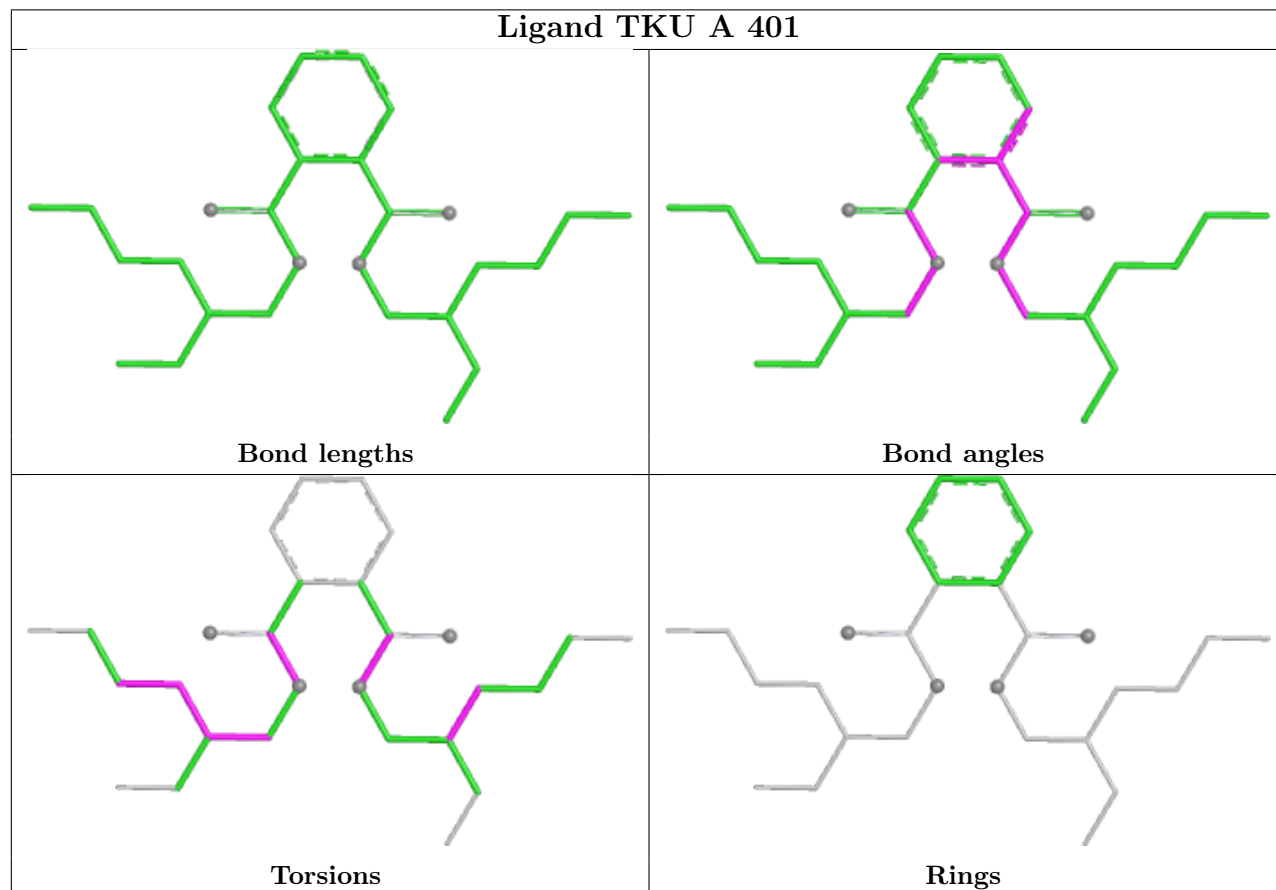
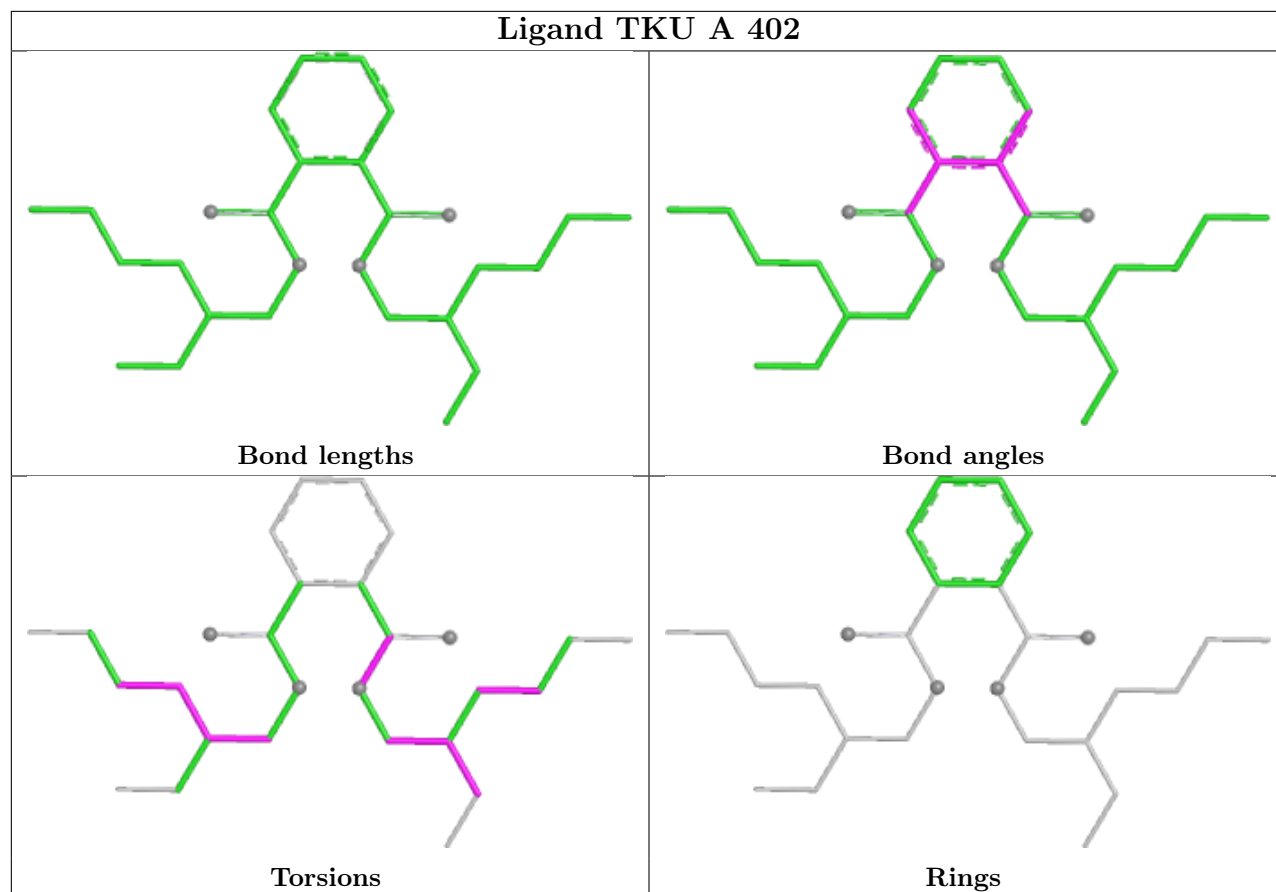
Mol	Chain	Res	Type	Atoms
2	A	402	TKU	O2-C9-O1-C8
2	A	402	TKU	C2-C3-C4-C5
2	A	401	TKU	C18-C21-C22-C23

There are no ring outliers.

1 monomer is involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	401	TKU	10	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 [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

EDS failed to run properly - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains

EDS failed to run properly - this section is therefore empty.

6.3 Carbohydrates

EDS failed to run properly - this section is therefore empty.

6.4 Ligands

EDS failed to run properly - this section is therefore empty.

6.5 Other polymers

EDS failed to run properly - this section is therefore empty.