



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 06:06 AM UTC

PDB ID : 1L8G / pdb_0000118g
Title : Crystal structure of PTP1B complexed with 7-(1,1-Dioxo-1H-benzo[d]isothiazol-3-ylloxymethyl)-2-(oxalyl-amino)-4,7-dihydro-5H-thieno[2,3-c]pyran-3-carboxylic acid
Authors : Iversen, L.F.; Andersen, H.S.; Moller, K.B.; Olsen, O.H.; Peters, G.H.; Branner, S.; Mortensen, S.B.; Hansen, T.K.; Lau, J.; Ge, Y.; Holsworth, D.D.; Newman, M.J.; Moller, N.P.H.
Deposited on : 2002-03-20
Resolution : 2.50 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)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
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

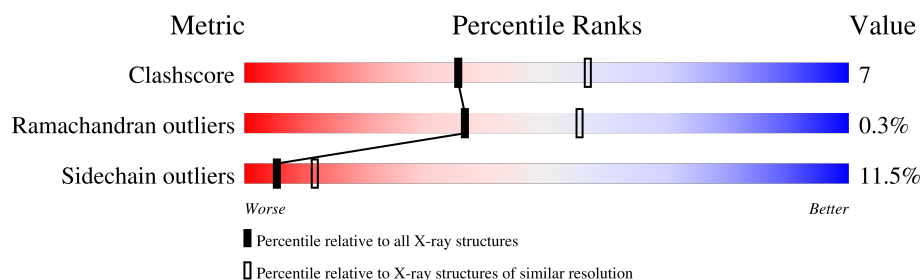
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.50 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	6492 (2.50-2.50)
Ramachandran outliers	187476	6378 (2.50-2.50)
Sidechain outliers	187428	6380 (2.50-2.50)

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 was not executed.

Mol	Chain	Length	Quality of chain
1	A	321	

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 2593 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.

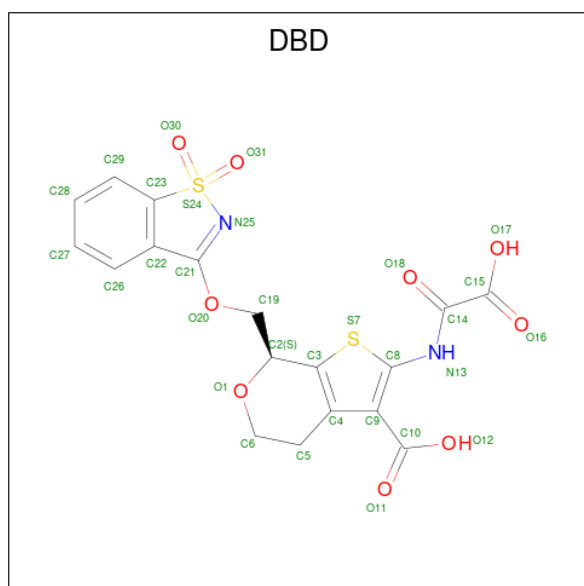
- Molecule 1 is a protein called PROTEIN-TYROSINE PHOSPHATASE, NON-RECEPTOR TYPE 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	297	2426	1535	418	457	16	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	151	THR	SER	conflict	UNP P18031
A	252	ASP	GLU	conflict	UNP P18031

- Molecule 2 is 7-(1,1-DIOXO-1H-BENZO[D]ISOTHIAZOL-3-YLOXYMETHYL)-2-(OXALYL-AMINO)-4,7-DIHYDRO-5H-THIENO[2,3-C]PYRAN-3-CARBOXYLIC ACID (CCD ID: DBD) (formula: C₁₈H₁₄N₂O₉S₂).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
2	A	1	31	18	2	9	2	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	136	Total 136	O 136	0	0

3 Residue-property plots

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 was not executed.

• Molecule 1: PROTEIN-TYROSINE PHOSPHATASE, NON-RECEPTOR TYPE 1



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	88.26Å 88.26Å 103.62Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	20.00 – 2.50	Depositor
% Data completeness (in resolution range)	(Not available) (20.00-2.50)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR 3.843	Depositor
R, R_{free}	0.189 , 0.270	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2593	wwPDB-VP
Average B, all atoms (Å ²)	18.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

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

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	1.33	9/2481 (0.4%)	1.78	39/3345 (1.2%)

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	3

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	240	ASP	C-O	-9.01	1.13	1.24
1	A	151	THR	C-O	-7.42	1.14	1.24
1	A	151	THR	N-CA	6.81	1.54	1.46
1	A	151	THR	C-N	6.60	1.43	1.33
1	A	151	THR	CA-C	6.45	1.61	1.52
1	A	297	GLU	CA-C	6.11	1.60	1.52
1	A	45	ARG	CZ-NH2	-5.94	1.25	1.33
1	A	70	SER	CA-C	-5.66	1.45	1.52
1	A	203	SER	CA-C	-5.45	1.45	1.52

All (39) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	168	THR	CA-CB-OG1	9.42	123.73	109.60
1	A	25	HIS	CA-CB-CG	-9.32	104.48	113.80
1	A	151	THR	CB-CA-C	-8.02	95.80	110.63
1	A	84	THR	CA-CB-OG1	7.97	121.56	109.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	243	SER	CB-CA-C	-7.85	98.90	111.06
1	A	178	THR	CB-CA-C	-7.82	98.98	111.18
1	A	243	SER	N-CA-CB	-7.51	99.05	110.91
1	A	242	SER	CA-C-N	-6.48	112.85	122.83
1	A	242	SER	C-N-CA	-6.48	112.85	122.83
1	A	164	THR	CA-CB-OG1	6.36	119.14	109.60
1	A	244	VAL	N-CA-CB	6.05	119.48	111.25
1	A	151	THR	CA-C-N	-6.04	112.87	122.29
1	A	151	THR	C-N-CA	-6.04	112.87	122.29
1	A	187	SER	N-CA-CB	-6.02	105.09	111.29
1	A	274	VAL	N-CA-C	6.01	116.19	110.42
1	A	165	THR	N-CA-CB	-5.88	103.22	110.98
1	A	178	THR	N-CA-CB	-5.84	103.08	111.54
1	A	176	TYR	CA-C-N	-5.68	113.63	122.37
1	A	176	TYR	C-N-CA	-5.68	113.63	122.37
1	A	245	ASP	N-CA-CB	-5.65	100.91	110.46
1	A	198	VAL	CA-CB-CG2	5.64	120.00	110.40
1	A	297	GLU	N-CA-CB	5.59	118.94	110.28
1	A	151	THR	N-CA-CB	-5.58	101.63	110.22
1	A	14	GLY	CA-C-N	-5.54	114.38	122.86
1	A	14	GLY	C-N-CA	-5.54	114.38	122.86
1	A	151	THR	N-CA-C	-5.45	105.44	111.71
1	A	44	ASN	CA-CB-CG	-5.41	107.19	112.60
1	A	107	VAL	CA-CB-CG2	5.34	119.48	110.40
1	A	243	SER	CA-C-N	-5.31	116.60	123.19
1	A	243	SER	C-N-CA	-5.31	116.60	123.19
1	A	252	ASP	CA-CB-CG	-5.29	107.31	112.60
1	A	249	VAL	CA-CB-CG1	5.28	119.38	110.40
1	A	242	SER	CA-CB-OG	5.20	121.49	111.10
1	A	9	GLN	N-CA-CB	-5.15	102.29	110.22
1	A	49	VAL	CA-CB-CG1	5.08	119.04	110.40
1	A	191	PHE	CA-CB-CG	-5.03	108.77	113.80
1	A	109	MET	CB-CA-C	-5.02	102.05	110.19
1	A	154	THR	CA-C-N	-5.00	116.64	123.10
1	A	154	THR	C-N-CA	-5.00	116.64	123.10

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	105	ARG	Sidechain
1	A	221	ARG	Sidechain

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Mol	Chain	Res	Type	Group
1	A	66	TYR	Sidechain

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	2426	0	2381	36	0
2	A	31	0	12	0	0
3	A	136	0	0	0	0
All	All	2593	0	2393	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 7.

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)
1:A:112:ARG:HG3	1:A:112:ARG:HH11	1.56	0.71
1:A:112:ARG:HH11	1:A:112:ARG:CG	2.16	0.57
1:A:8:GLU:O	1:A:12:LYS:HG3	2.07	0.54
1:A:2:GLU:HG3	1:A:4:GLU:H	1.72	0.54
1:A:227:LEU:CD1	1:A:249:VAL:HG22	2.38	0.54
1:A:134:ILE:HG13	1:A:141:LYS:HG3	1.90	0.53
1:A:105:ARG:HG2	1:A:105:ARG:HH11	1.74	0.53
1:A:31:PRO:HB2	1:A:33:ARG:NE	2.25	0.52
1:A:176:TYR:CE1	1:A:179:TRP:HB2	2.46	0.51
1:A:238:ARG:HG3	1:A:240:ASP:H	1.76	0.50
1:A:238:ARG:HD2	1:A:243:SER:OG	2.13	0.49
1:A:77:ALA:HB1	1:A:233:LEU:HD13	1.94	0.48
1:A:100:TRP:CZ3	1:A:169:ARG:HG3	2.49	0.48
1:A:245:ASP:O	1:A:249:VAL:HG13	2.14	0.47
1:A:33:ARG:HE	1:A:33:ARG:HB2	1.62	0.46
1:A:111:ASN:HD22	1:A:215:CYS:HA	1.81	0.46
1:A:45:ARG:NH2	1:A:121:CYS:HA	2.31	0.45
1:A:6:GLU:OE2	1:A:247:LYS:NZ	2.46	0.45
1:A:112:ARG:CG	1:A:112:ARG:NH1	2.78	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:46:TYR:HB2	1:A:49:VAL:HG13	1.99	0.44
1:A:227:LEU:HD12	1:A:249:VAL:HG22	2.00	0.44
1:A:59:LEU:HB2	1:A:65:ASP:HA	1.99	0.42
1:A:156:ARG:HH12	1:A:175:HIS:HD2	1.68	0.42
1:A:162:ASN:OD1	1:A:162:ASN:C	2.62	0.42
1:A:31:PRO:CB	1:A:33:ARG:HD3	2.50	0.42
1:A:24:ARG:NH2	1:A:262:GLN:O	2.53	0.42
1:A:59:LEU:HB3	1:A:61:GLN:HG2	2.01	0.42
1:A:31:PRO:HB3	1:A:33:ARG:HD3	2.02	0.42
1:A:267:LEU:O	1:A:270:SER:HB2	2.20	0.42
1:A:34:VAL:HG13	1:A:53:ASP:OD1	2.20	0.41
1:A:238:ARG:H	1:A:238:ARG:HG2	1.67	0.41
1:A:291:TRP:O	1:A:295:SER:HB3	2.20	0.41
1:A:156:ARG:HH12	1:A:175:HIS:CD2	2.39	0.41
1:A:176:TYR:CD1	1:A:179:TRP:HB2	2.56	0.41
1:A:115:GLU:HB2	1:A:120:LYS:HG3	2.02	0.41
1:A:2:GLU:HA	1:A:2:GLU:OE2	2.21	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	295/321 (92%)	282 (96%)	12 (4%)	1 (0%)	36 55

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	261	ILE

5.3.2 Protein sidechains ⓘ

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	270/294 (92%)	239 (88%)	31 (12%)	5 11

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2	GLU
1	A	11	ASP
1	A	33	ARG
1	A	34	VAL
1	A	49	VAL
1	A	59	LEU
1	A	71	LEU
1	A	80	SER
1	A	88	LEU
1	A	113	VAL
1	A	130	GLU
1	A	131	LYS
1	A	132	GLU
1	A	134	ILE
1	A	140	LEU
1	A	158	LEU
1	A	160	LEU
1	A	163	LEU
1	A	168	THR
1	A	172	LEU
1	A	207	GLU
1	A	233	LEU
1	A	234	LEU
1	A	237	LYS
1	A	244	VAL
1	A	249	VAL
1	A	251	LEU
1	A	252	ASP
1	A	272	LEU
1	A	287	VAL

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Mol	Chain	Res	Type
1	A	294	LEU

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	9	GLN
1	A	85	GLN
1	A	102	GLN
1	A	111	ASN
1	A	123	GLN
1	A	175	HIS
1	A	208	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

1 ligand is 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	DBD	A	322	-	32,34,34	1.95	6 (18%)	42,51,51	4.20	18 (42%)

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	DBD	A	322	-	-	3/16/42/42	0/4/4/4

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	322	DBD	C8-N13	4.87	1.44	1.38
2	A	322	DBD	C23-S24	-4.17	1.72	1.77
2	A	322	DBD	O20-C21	3.44	1.40	1.34
2	A	322	DBD	C9-C8	-3.15	1.34	1.39
2	A	322	DBD	C29-C23	3.00	1.42	1.39
2	A	322	DBD	O30-S24	-2.79	1.40	1.44

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	322	DBD	C23-S24-N25	-12.42	87.31	96.57
2	A	322	DBD	C22-C23-S24	10.43	114.35	106.93
2	A	322	DBD	C8-C9-C4	-9.62	106.79	111.75
2	A	322	DBD	C21-N25-S24	8.74	121.82	110.38
2	A	322	DBD	C29-C23-C22	-7.31	116.40	122.75
2	A	322	DBD	O20-C21-N25	6.60	132.02	124.67
2	A	322	DBD	C3-S7-C8	-6.41	88.09	91.13
2	A	322	DBD	C22-C21-N25	-4.51	106.37	115.44
2	A	322	DBD	O31-S24-O30	4.26	122.26	116.35
2	A	322	DBD	C6-C5-C4	-4.20	103.66	108.87
2	A	322	DBD	C6-O1-C2	3.92	117.48	111.05
2	A	322	DBD	C9-C8-S7	3.80	117.62	112.62
2	A	322	DBD	C9-C8-N13	-3.78	120.85	124.61
2	A	322	DBD	C26-C22-C23	3.68	123.82	119.87
2	A	322	DBD	O12-C10-O11	-2.75	117.36	123.90
2	A	322	DBD	O17-C15-O16	-2.54	117.86	123.90
2	A	322	DBD	O12-C10-C9	2.49	122.94	116.58
2	A	322	DBD	C10-C9-C8	2.35	123.57	120.09

There are no chirality outliers.

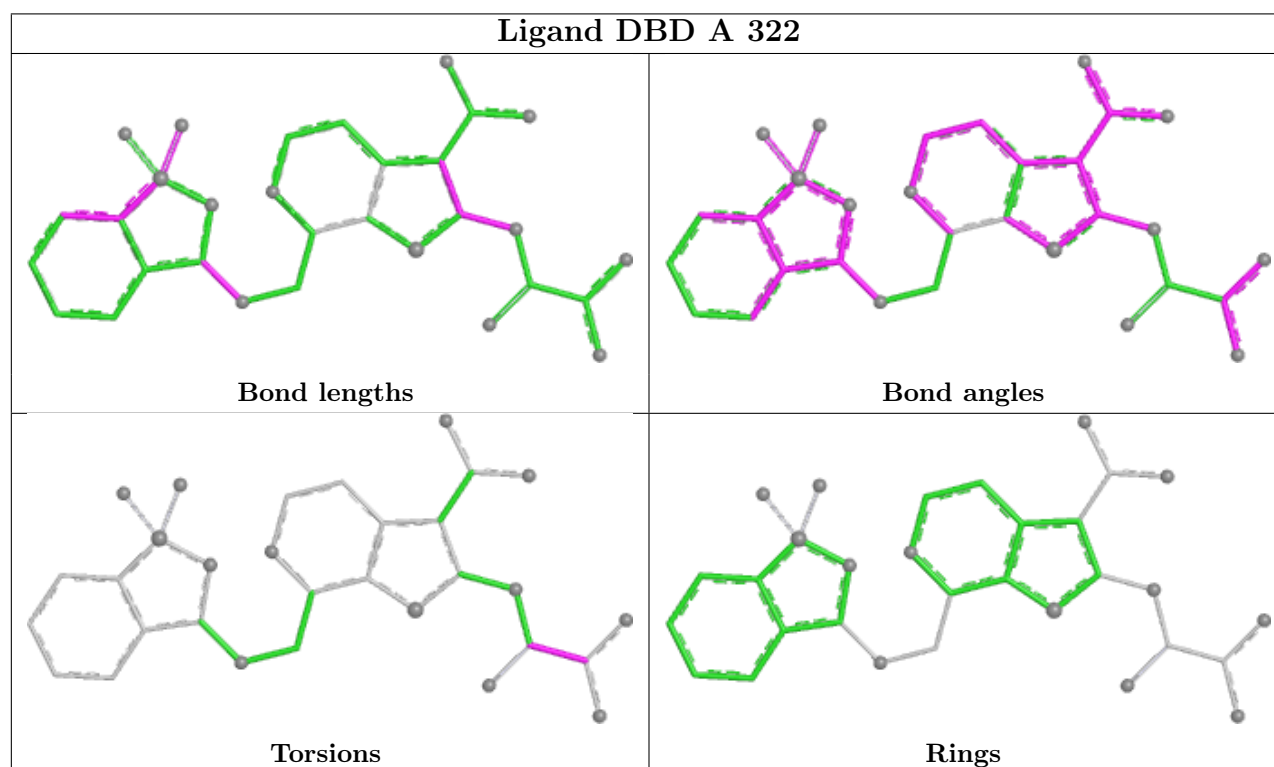
All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	322	DBD	N13-C14-C15-O16
2	A	322	DBD	O18-C14-C15-O16
2	A	322	DBD	O18-C14-C15-O17

There are no ring outliers.

No monomer is involved in short contacts.

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

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.