



# Full wwPDB X-ray Structure Validation Report ⓘ

May 27, 2020 – 02:32 am BST

PDB ID : 1C88  
Title : CRYSTAL STRUCTURE OF PROTEIN TYROSINE PHOSPHATASE 1B  
COMPLEXED WITH 2-(OXALYL-AMINO)-4,5,6,7-TETRAHYDRO-THIE  
NO[2,3-C]PYRIDINE-3-CARBOXYLIC ACID  
Authors : Iversen, L.F.; Andersen, H.S.; Mortensen, S.B.; Moller, N.P.  
Deposited on : 2000-04-16  
Resolution : 1.80 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](mailto: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) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.11

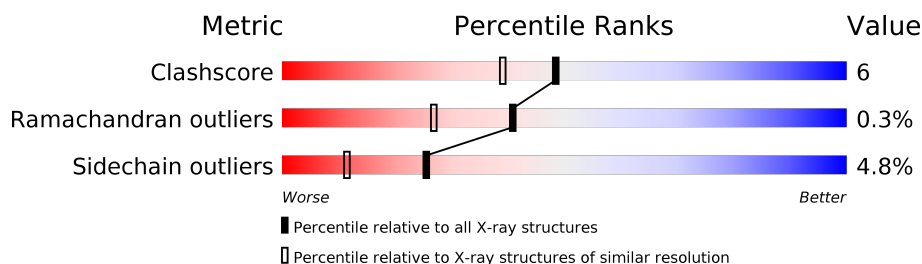
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.80 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	141614	6793 (1.80-1.80)
Ramachandran outliers	138981	6697 (1.80-1.80)
Sidechain outliers	138945	6696 (1.80-1.80)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	298	<div> <div style="width: 76%; background-color: green;"></div> <div style="width: 19%; background-color: yellow;"></div> <div style="width: 5%; background-color: orange;"></div> <div style="width: 0%; background-color: red;"></div> <div style="width: 0%; background-color: grey;"></div> </div> <div>76% 19% .</div>

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 2669 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.

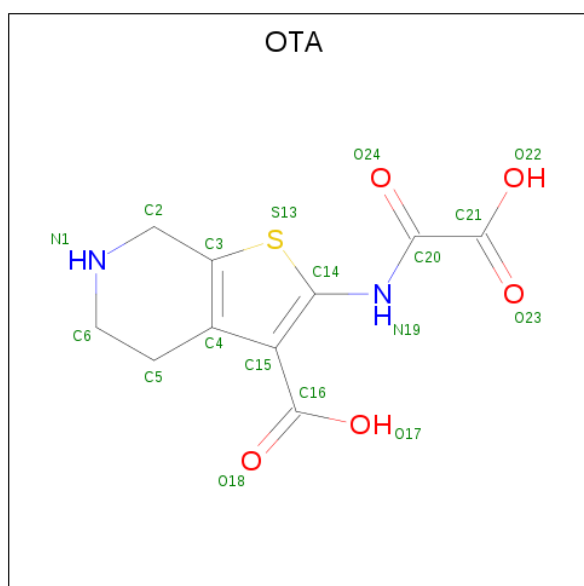
- Molecule 1 is a protein called PROTEIN (PROTEIN-TYROSINE PHOSPHATASE 1B).

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 2-(OXALYL-AMINO)-4,5,6,7-TETRAHYDRO-THIENO[2,3-C]PYRIDINE-3-CARBOXYLIC ACID (three-letter code: OTA) (formula: C<sub>10</sub>H<sub>10</sub>N<sub>2</sub>O<sub>5</sub>S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
2	A	1	18	10	2	5	1	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	225	Total 225	O 225	0	0

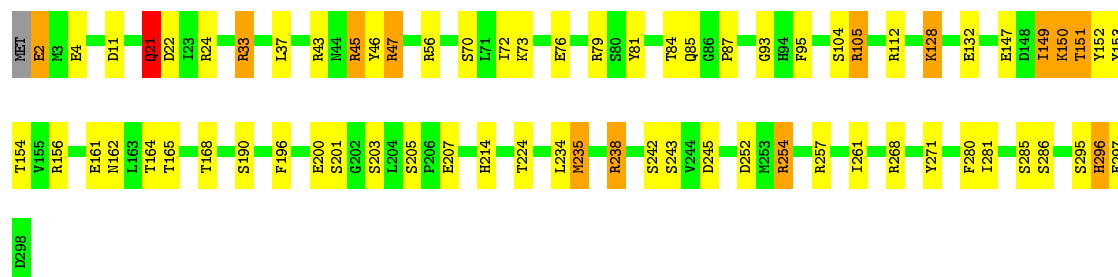
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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 (PROTEIN-TYROSINE PHOSPHATASE 1B)

Chain A:  76% 19% .



## 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, $\alpha$ , $\beta$ , $\gamma$	88.29 Å 88.29 Å 103.75 Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	6.00 – 1.80	Depositor
% Data completeness (in resolution range)	98.7 (6.00-1.80)	Depositor
$R_{merge}$	0.01	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	X-PLOR 3.851	Depositor
R, $R_{free}$	0.200 , 0.228	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2669	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	30.0	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: OTA

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	1.60	12/2480 (0.5%)	1.76	49/3342 (1.5%)

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	1

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	150	LYS	N-CA	48.63	2.43	1.46
1	A	149	ILE	CG1-CD1	15.28	2.55	1.50
1	A	242	SER	CB-OG	6.76	1.51	1.42
1	A	161	GLU	CD-OE1	-5.60	1.19	1.25
1	A	104	SER	CB-OG	5.59	1.49	1.42
1	A	205	SER	CB-OG	5.51	1.49	1.42
1	A	203	SER	CB-OG	5.48	1.49	1.42
1	A	286	SER	CB-OG	5.37	1.49	1.42
1	A	201	SER	CB-OG	5.35	1.49	1.42
1	A	93	GLY	CA-C	5.30	1.60	1.51
1	A	70	SER	CB-OG	5.26	1.49	1.42
1	A	190	SER	CB-OG	5.06	1.48	1.42

All (49) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	254	ARG	NE-CZ-NH2	-18.30	111.15	120.30

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	150	LYS	N-CA-CB	-15.93	81.92	110.60
1	A	43	ARG	NE-CZ-NH2	-15.53	112.54	120.30
1	A	254	ARG	NE-CZ-NH1	15.33	127.97	120.30
1	A	238	ARG	NE-CZ-NH1	14.91	127.75	120.30
1	A	238	ARG	NE-CZ-NH2	-13.96	113.32	120.30
1	A	268	ARG	NE-CZ-NH2	-12.71	113.94	120.30
1	A	45	ARG	NE-CZ-NH1	12.62	126.61	120.30
1	A	152	TYR	CB-CG-CD2	-11.73	113.96	121.00
1	A	105	ARG	NE-CZ-NH2	-11.26	114.67	120.30
1	A	43	ARG	NE-CZ-NH1	10.81	125.70	120.30
1	A	47	ARG	NE-CZ-NH1	10.61	125.60	120.30
1	A	152	TYR	CB-CG-CD1	10.53	127.32	121.00
1	A	150	LYS	N-CA-C	-10.43	82.85	111.00
1	A	105	ARG	NE-CZ-NH1	10.36	125.48	120.30
1	A	149	ILE	CB-CG1-CD1	-8.92	88.91	113.90
1	A	33	ARG	NE-CZ-NH1	-8.62	115.99	120.30
1	A	254	ARG	CD-NE-CZ	8.17	135.04	123.60
1	A	268	ARG	NE-CZ-NH1	8.02	124.31	120.30
1	A	45	ARG	NE-CZ-NH2	-7.97	116.31	120.30
1	A	47	ARG	NE-CZ-NH2	-6.86	116.87	120.30
1	A	252	ASP	CB-CG-OD2	-6.84	112.14	118.30
1	A	254	ARG	CB-CG-CD	6.66	128.92	111.60
1	A	105	ARG	CD-NE-CZ	6.54	132.76	123.60
1	A	81	TYR	CB-CG-CD1	-6.42	117.15	121.00
1	A	150	LYS	CB-CA-C	6.29	122.97	110.40
1	A	73	LYS	N-CA-CB	-6.27	99.32	110.60
1	A	257	ARG	CD-NE-CZ	6.13	132.19	123.60
1	A	196	PHE	CB-CG-CD1	5.94	124.95	120.80
1	A	164	THR	CA-CB-OG1	5.89	121.37	109.00
1	A	151	THR	N-CA-CB	-5.84	99.21	110.30
1	A	165	THR	N-CA-CB	-5.83	99.22	110.30
1	A	271	TYR	CB-CG-CD1	-5.79	117.52	121.00
1	A	2	GLU	N-CA-CB	-5.79	100.18	110.60
1	A	33	ARG	NE-CZ-NH2	5.74	123.17	120.30
1	A	150	LYS	CA-C-O	5.70	132.07	120.10
1	A	162	ASN	CB-CA-C	5.67	121.75	110.40
1	A	112	ARG	CD-NE-CZ	5.52	131.33	123.60
1	A	150	LYS	CA-C-N	-5.52	105.06	117.20
1	A	79	ARG	NE-CZ-NH2	-5.40	117.60	120.30
1	A	200	GLU	CA-CB-CG	-5.37	101.59	113.40
1	A	295	SER	N-CA-CB	-5.33	102.50	110.50
1	A	21	GLN	CB-CG-CD	5.29	125.36	111.60

*Continued on next page...*



*Continued from previous page...*

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	224	THR	CA-CB-CG2	5.24	119.74	112.40
1	A	296	HIS	CA-CB-CG	-5.16	104.82	113.60
1	A	46	TYR	CB-CG-CD1	-5.09	117.94	121.00
1	A	245	ASP	N-CA-CB	-5.02	101.57	110.60
1	A	56	ARG	NE-CZ-NH2	5.01	122.81	120.30
1	A	56	ARG	CD-NE-CZ	5.01	130.61	123.60

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	24	ARG	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	2380	29	0
2	A	18	0	8	0	0
3	A	225	0	0	0	0
All	All	2669	0	2388	29	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 6.

All (29) 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:149:ILE:CD1	1:A:149:ILE:CG1	2.55	0.84
1:A:150:LYS:CA	1:A:150:LYS:N	2.43	0.81
1:A:45:ARG:H	1:A:85:GLN:HE22	1.37	0.72
1:A:149:ILE:HA	1:A:150:LYS:N	2.09	0.68
1:A:149:ILE:CA	1:A:150:LYS:N	2.63	0.62
1:A:150:LYS:HA	1:A:297:GLU:O	1.98	0.62
1:A:149:ILE:O	1:A:150:LYS:N	2.33	0.62

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:149:ILE:C	1:A:150:LYS:N	2.55	0.60
1:A:234:LEU:O	1:A:238:ARG:HG2	2.03	0.59
1:A:76:GLU:CD	1:A:238:ARG:HH22	2.08	0.56
1:A:150:LYS:CB	1:A:150:LYS:N	2.69	0.56
1:A:45:ARG:H	1:A:85:GLN:NE2	2.04	0.53
1:A:151:THR:HG21	1:A:296:HIS:O	2.12	0.50
1:A:21:GLN:HG2	1:A:22:ASP:N	2.26	0.50
1:A:235:MET:HG2	1:A:281:ILE:HG21	1.95	0.49
1:A:147:GLU:HB2	1:A:156:ARG:HG2	1.94	0.48
1:A:149:ILE:CD1	1:A:149:ILE:HB	2.46	0.46
1:A:238:ARG:HD3	1:A:243:SER:OG	2.16	0.45
1:A:2:GLU:HG3	1:A:4:GLU:H	1.82	0.45
1:A:84:THR:O	1:A:214:HIS:HB2	2.17	0.44
1:A:149:ILE:CB	1:A:149:ILE:CD1	2.95	0.44
1:A:76:GLU:CD	1:A:238:ARG:NH2	2.71	0.44
1:A:150:LYS:N	1:A:150:LYS:C	2.72	0.43
1:A:128:LYS:HB3	1:A:128:LYS:HE3	1.80	0.43
1:A:87:PRO:HG3	1:A:95:PHE:CD1	2.54	0.42
1:A:150:LYS:N	1:A:153:TYR:O	2.53	0.42
1:A:280:PHE:CD1	1:A:285:SER:HA	2.55	0.42
1:A:149:ILE:HG13	1:A:154:THR:HG23	2.02	0.41
1:A:235:MET:CG	1:A:281:ILE:HG21	2.52	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	293/298 (98%)	286 (98%)	6 (2%)	1 (0%)	41 27

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	261	ILE

### 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	270/271 (100%)	257 (95%)	13 (5%)	25	11

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	11	ASP
1	A	21	GLN
1	A	33	ARG
1	A	37	LEU
1	A	47	ARG
1	A	72	ILE
1	A	105	ARG
1	A	128	LYS
1	A	132	GLU
1	A	168	THR
1	A	207	GLU
1	A	235	MET
1	A	254	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	21	GLN
1	A	61	GLN
1	A	85	GLN
1	A	111	ASN
1	A	123	GLN
1	A	208	HIS

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

## 5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

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	OTA	A	301	-	12,19,19	1.77	3 (25%)	6,27,27	1.51	1 (16%)

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	OTA	A	301	-	-	0/2/19/19	0/2/2/2

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	301	OTA	C15-C14	-3.96	1.33	1.41
2	A	301	OTA	C3-S13	3.04	1.79	1.74
2	A	301	OTA	C6-N1	2.08	1.54	1.47

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	301	OTA	C3-C2-N1	-2.17	107.97	113.19

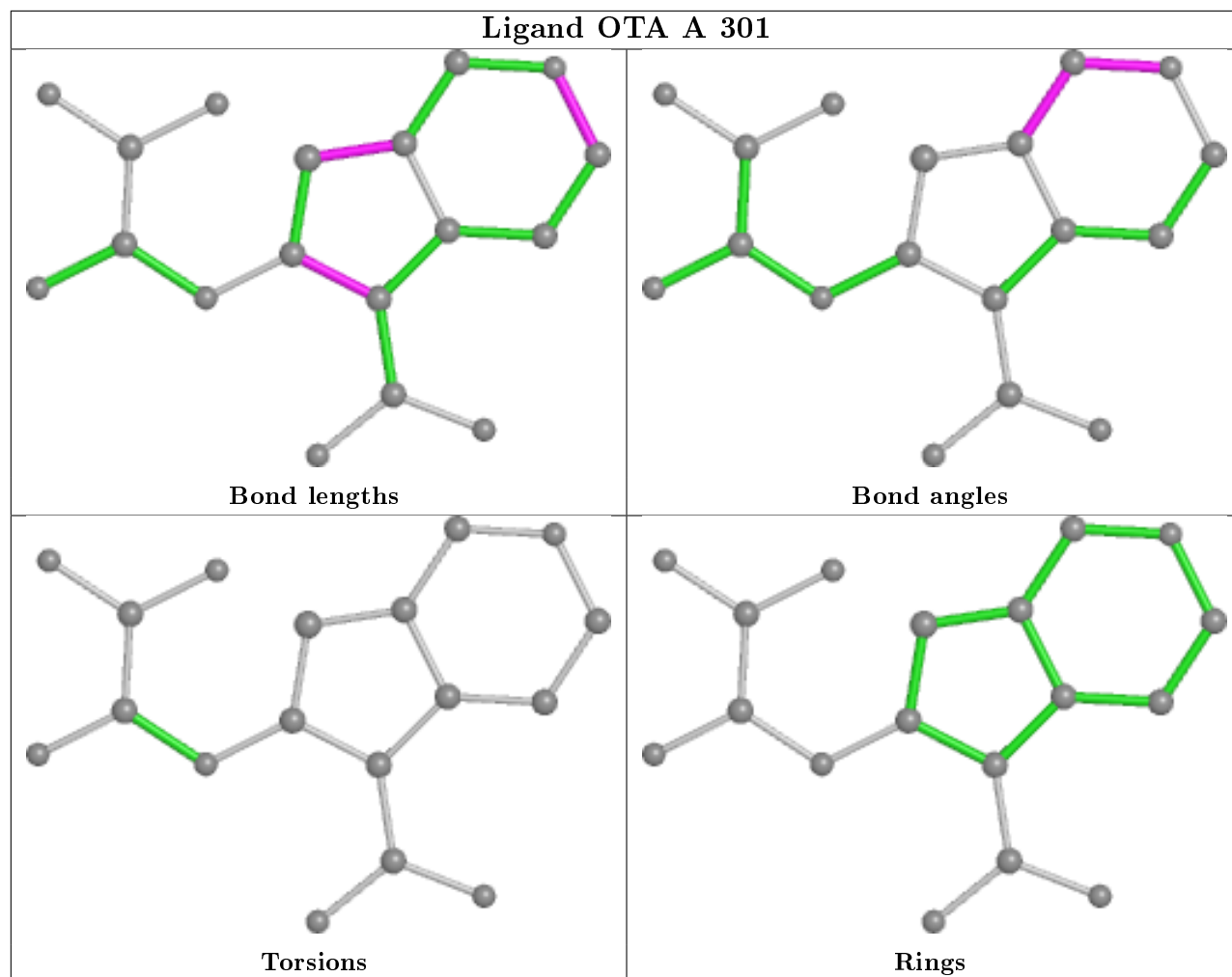
There are no chirality outliers.

There are no torsion outliers.

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 [i](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	A	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	149:ILE	C	150:LYS	N	2.55

## 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.