



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 4, 2023 – 10:25 PM EDT

PDB ID : 6VHY  
Title : NpsA-ThdA, an artificially fused Adenylation-PCP di-domain NRPS from *Klebsiella oxytoca*  
Authors : Kreitler, D.F.; Gulick, A.M.  
Deposited on : 2020-01-10  
Resolution : 3.00 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 types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity : **FAILED**  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : **FAILED**  
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) : 2.35.1

## 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 3.00 Å.

There are no overall percentile quality scores available for this entry.

MolProbity and EDS failed to run properly - the sequence quality summary graphics cannot be shown.

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 15436 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 NpsA Adenylation Domain, Non-ribosomal peptide synthetase fusion protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	527	3860	2456	658	724	22	0	0	0
1	B	527	3762	2411	637	694	20	0	0	0
1	C	540	3950	2527	664	736	23	0	0	0
1	D	499	3662	2335	627	678	22	0	0	0

There are 32 discrepancies between the modelled and reference sequences:

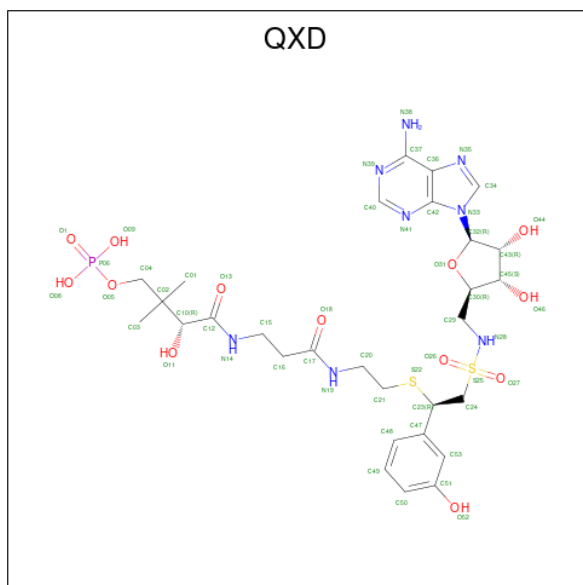
Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	expression tag	UNP A0A2U4DY99
A	0	HIS	-	expression tag	UNP A0A2U4DY99
A	258	SER	LEU	variant	UNP A0A2U4DY99
A	312	ALA	GLU	engineered mutation	UNP A0A2U4DY99
A	313	ALA	GLU	engineered mutation	UNP A0A2U4DY99
A	314	ALA	GLN	engineered mutation	UNP A0A2U4DY99
A	507	ALA	-	linker	UNP A0A2U4DY99
A	508	SER	-	linker	UNP A0A2U4DY99
B	-1	GLY	-	expression tag	UNP A0A2U4DY99
B	0	HIS	-	expression tag	UNP A0A2U4DY99
B	258	SER	LEU	variant	UNP A0A2U4DY99
B	312	ALA	GLU	engineered mutation	UNP A0A2U4DY99
B	313	ALA	GLU	engineered mutation	UNP A0A2U4DY99
B	314	ALA	GLN	engineered mutation	UNP A0A2U4DY99
B	507	ALA	-	linker	UNP A0A2U4DY99
B	508	SER	-	linker	UNP A0A2U4DY99
C	-1	GLY	-	expression tag	UNP A0A2U4DY99
C	0	HIS	-	expression tag	UNP A0A2U4DY99
C	258	SER	LEU	variant	UNP A0A2U4DY99
C	312	ALA	GLU	engineered mutation	UNP A0A2U4DY99

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Chain	Residue	Modelled	Actual	Comment	Reference
C	313	ALA	GLU	engineered mutation	UNP A0A2U4DY99
C	314	ALA	GLN	engineered mutation	UNP A0A2U4DY99
C	507	ALA	-	linker	UNP A0A2U4DY99
C	508	SER	-	linker	UNP A0A2U4DY99
D	-1	GLY	-	expression tag	UNP A0A2U4DY99
D	0	HIS	-	expression tag	UNP A0A2U4DY99
D	258	SER	LEU	variant	UNP A0A2U4DY99
D	312	ALA	GLU	engineered mutation	UNP A0A2U4DY99
D	313	ALA	GLU	engineered mutation	UNP A0A2U4DY99
D	314	ALA	GLN	engineered mutation	UNP A0A2U4DY99
D	507	ALA	-	linker	UNP A0A2U4DY99
D	508	SER	-	linker	UNP A0A2U4DY99

- Molecule 2 is 5'-deoxy-5'-({[(2R)-2-{{2-({N-[(2R)-2-hydroxy-3,3-dimethyl-4-(phosphonoxy)butanoyl]-beta-alanyl}amino)ethyl}sulfanyl}-2-(3-hydroxyphenyl)ethyl}sulfonyl}amino)adenosine (three-letter code: QXD) (formula: C<sub>29</sub>H<sub>43</sub>N<sub>8</sub>O<sub>13</sub>PS<sub>2</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf		
			Total	C	N	O	P			S	
2	A	1	Total	52	29	8	12	1	2	0	0
2	B	1	Total	52	29	8	12	1	2	0	0
2	C	1	Total	52	29	8	12	1	2	0	0
2	D	1	Total	45	24	7	11	1	2	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	C	1	Total O 1 1	0	0

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

### 3 Data and refinement statistics

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

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	58.54Å 98.72Å 118.75Å 95.33° 96.34° 106.51°	Depositor
Resolution (Å)	47.61 – 3.00	Depositor
% Data completeness (in resolution range)	90.8 (47.61-3.00)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.12	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.23 (at 3.01Å)	Xtrriage
Refinement program	PHENIX 1.15_3459	Depositor
R, $R_{free}$	0.214 , 0.260	Depositor
Wilson B-factor (Å <sup>2</sup> )	70.9	Xtrriage
Anisotropy	0.225	Xtrriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	15436	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	83.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.44% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup> Intensities estimated from amplitudes.

<sup>2</sup> Theoretical 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.

## 4 Model quality [i](#)

### 4.1 Standard geometry [i](#)

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

### 4.2 Too-close contacts [i](#)

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

### 4.3 Torsion angles [i](#)

#### 4.3.1 Protein backbone [i](#)

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

#### 4.3.2 Protein sidechains [i](#)

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

#### 4.3.3 RNA [i](#)

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

### 4.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

### 4.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 4.6 Ligand geometry [i](#)

4 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	QXD	D	601	1	38,47,56	2.02	8 (21%)	44,69,82	2.28	17 (38%)
2	QXD	C	601	1	45,55,56	2.11	12 (26%)	52,79,82	1.95	18 (34%)
2	QXD	B	601	1	45,55,56	2.03	10 (22%)	52,79,82	2.40	19 (36%)
2	QXD	A	601	1	45,55,56	2.26	12 (26%)	52,79,82	2.01	20 (38%)

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	QXD	D	601	1	-	15/25/51/65	0/4/4/4
2	QXD	C	601	1	-	18/41/64/65	0/4/4/4
2	QXD	B	601	1	-	16/41/64/65	0/4/4/4
2	QXD	A	601	1	-	11/41/64/65	0/4/4/4

All (42) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	601	QXD	O31-C32	-6.19	1.32	1.41
2	D	601	QXD	O31-C32	-5.89	1.32	1.41
2	C	601	QXD	C12-N14	5.77	1.46	1.33
2	A	601	QXD	C12-N14	5.68	1.46	1.33
2	A	601	QXD	P06-O05	5.63	1.79	1.62
2	D	601	QXD	C12-N14	5.43	1.46	1.32
2	A	601	QXD	O31-C32	-5.26	1.33	1.41
2	B	601	QXD	C21-S22	5.10	1.88	1.81
2	A	601	QXD	C17-N19	5.07	1.44	1.33
2	C	601	QXD	O31-C32	-4.90	1.34	1.41
2	C	601	QXD	P06-O05	4.89	1.77	1.62
2	C	601	QXD	C21-S22	4.83	1.87	1.81
2	A	601	QXD	C21-S22	4.80	1.87	1.81
2	B	601	QXD	P06-O05	4.79	1.76	1.62
2	D	601	QXD	P06-O05	4.68	1.76	1.62
2	C	601	QXD	C17-N19	4.62	1.43	1.33
2	D	601	QXD	C43-C32	4.58	1.60	1.53
2	B	601	QXD	C17-N19	4.38	1.43	1.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	601	QXD	C12-N14	4.24	1.42	1.33
2	A	601	QXD	C43-C32	3.83	1.59	1.53
2	B	601	QXD	C43-C32	3.35	1.58	1.53
2	A	601	QXD	C16-C17	3.26	1.57	1.51
2	C	601	QXD	C43-C32	3.10	1.58	1.53
2	A	601	QXD	C40-N41	3.00	1.36	1.32
2	C	601	QXD	C42-N41	2.89	1.39	1.35
2	C	601	QXD	C40-N41	2.83	1.36	1.32
2	D	601	QXD	C40-N41	2.70	1.36	1.32
2	A	601	QXD	C42-N41	2.50	1.39	1.35
2	A	601	QXD	C15-C16	2.46	1.59	1.51
2	D	601	QXD	C47-C23	2.43	1.53	1.51
2	C	601	QXD	C16-C17	2.40	1.55	1.51
2	A	601	QXD	C37-N38	2.37	1.42	1.34
2	C	601	QXD	C37-N38	2.35	1.42	1.34
2	C	601	QXD	C15-C16	2.30	1.58	1.51
2	A	601	QXD	S25-N28	2.29	1.67	1.61
2	B	601	QXD	C16-C17	2.27	1.55	1.51
2	D	601	QXD	C37-N38	2.19	1.42	1.34
2	D	601	QXD	S25-N28	2.13	1.66	1.61
2	C	601	QXD	C40-N39	2.09	1.37	1.33
2	B	601	QXD	C40-N41	2.06	1.35	1.32
2	B	601	QXD	C15-C16	2.04	1.57	1.51
2	B	601	QXD	C37-N38	2.03	1.41	1.34

All (74) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	601	QXD	O27-S25-O26	-7.39	108.65	119.35
2	D	601	QXD	O27-S25-O26	-7.17	108.96	119.35
2	A	601	QXD	O27-S25-O26	-6.67	109.69	119.35
2	C	601	QXD	O27-S25-O26	-6.62	109.75	119.35
2	B	601	QXD	C10-C12-N14	5.72	127.96	116.58
2	B	601	QXD	C15-N14-C12	4.94	131.40	122.59
2	B	601	QXD	O13-C12-N14	-4.87	112.55	122.99
2	D	601	QXD	C30-C29-N28	4.28	121.08	112.51
2	A	601	QXD	C30-C29-N28	4.23	120.98	112.51
2	B	601	QXD	C45-C43-C32	-3.88	95.14	100.98
2	D	601	QXD	O27-S25-C24	3.74	113.79	107.87
2	D	601	QXD	O11-C10-C12	-3.71	104.12	110.93
2	D	601	QXD	C10-C12-N14	3.70	120.22	117.18
2	B	601	QXD	C29-N28-S25	3.62	127.86	120.63

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	601	QXD	C30-C29-N28	3.56	119.64	112.51
2	B	601	QXD	C16-C17-N19	3.53	122.37	116.42
2	B	601	QXD	C30-C29-N28	3.35	119.23	112.51
2	D	601	QXD	C29-N28-S25	3.35	127.32	120.63
2	D	601	QXD	C48-C47-C53	-3.26	115.00	118.76
2	A	601	QXD	C15-C16-C17	3.18	117.66	112.36
2	B	601	QXD	C48-C47-C53	-3.16	115.12	118.76
2	A	601	QXD	C29-N28-S25	3.16	126.94	120.63
2	A	601	QXD	C16-C17-N19	3.14	121.70	116.42
2	C	601	QXD	C03-C02-C10	3.07	114.14	108.82
2	D	601	QXD	O31-C30-C45	-3.04	99.10	105.11
2	B	601	QXD	O31-C30-C45	-2.98	99.21	105.11
2	A	601	QXD	C48-C47-C53	-2.94	115.38	118.76
2	A	601	QXD	C03-C02-C10	2.93	113.91	108.82
2	C	601	QXD	C29-N28-S25	2.89	126.40	120.63
2	C	601	QXD	C48-C47-C53	-2.86	115.47	118.76
2	C	601	QXD	O31-C30-C45	-2.81	99.56	105.11
2	C	601	QXD	C15-C16-C17	2.72	116.88	112.36
2	D	601	QXD	C03-C02-C10	2.71	113.53	108.82
2	B	601	QXD	C03-C02-C10	2.68	113.47	108.82
2	C	601	QXD	C16-C17-N19	2.66	120.90	116.42
2	D	601	QXD	O13-C12-N14	-2.64	118.40	123.00
2	A	601	QXD	C24-C23-C47	2.64	118.41	113.78
2	A	601	QXD	O18-C17-N19	-2.63	118.05	123.01
2	B	601	QXD	O18-C17-N19	-2.63	118.06	123.01
2	B	601	QXD	C16-C15-N14	-2.61	106.63	111.90
2	A	601	QXD	O44-C43-C45	-2.59	103.44	111.82
2	C	601	QXD	O13-C12-N14	-2.58	117.45	122.99
2	B	601	QXD	C24-C23-C47	2.58	118.31	113.78
2	C	601	QXD	C36-C37-N38	2.58	124.27	120.35
2	B	601	QXD	C49-C50-C51	-2.51	115.77	119.31
2	B	601	QXD	C32-N33-C42	2.50	131.03	126.64
2	D	601	QXD	C51-C53-C47	2.48	122.24	120.11
2	A	601	QXD	O13-C12-N14	-2.48	117.67	122.99
2	C	601	QXD	C24-C23-C47	2.45	118.08	113.78
2	D	601	QXD	C49-C50-C51	-2.45	115.86	119.31
2	C	601	QXD	O44-C43-C45	-2.43	103.95	111.82
2	D	601	QXD	O13-C12-C10	2.43	121.37	119.04
2	C	601	QXD	O18-C17-N19	-2.39	118.51	123.01
2	D	601	QXD	O44-C43-C45	-2.35	104.22	111.82
2	B	601	QXD	O27-S25-C24	2.29	111.50	107.87
2	A	601	QXD	O31-C32-C43	2.27	110.24	106.93

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	601	QXD	C49-C50-C51	-2.23	116.17	119.31
2	C	601	QXD	C21-C20-N19	2.21	117.05	112.42
2	D	601	QXD	C36-C37-N38	2.20	123.69	120.35
2	D	601	QXD	C32-N33-C42	2.18	130.47	126.64
2	A	601	QXD	C45-C43-C32	-2.16	97.73	100.98
2	C	601	QXD	C49-C50-C51	-2.16	116.26	119.31
2	A	601	QXD	C24-S25-N28	2.15	111.78	107.34
2	A	601	QXD	C36-C37-N38	2.14	123.61	120.35
2	B	601	QXD	C51-C53-C47	2.12	121.93	120.11
2	B	601	QXD	C50-C51-C53	2.10	122.47	120.17
2	A	601	QXD	C51-C53-C47	2.08	121.90	120.11
2	C	601	QXD	O27-S25-C24	2.07	111.15	107.87
2	A	601	QXD	C21-C20-N19	2.06	116.74	112.42
2	C	601	QXD	C50-C51-C53	2.05	122.42	120.17
2	A	601	QXD	C50-C51-C53	2.05	122.42	120.17
2	C	601	QXD	C45-C43-C32	-2.04	97.91	100.98
2	A	601	QXD	C32-N33-C42	2.00	130.16	126.64
2	D	601	QXD	C50-C51-C53	2.00	122.37	120.17

There are no chirality outliers.

All (60) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	601	QXD	N14-C15-C16-C17
2	A	601	QXD	N19-C20-C21-S22
2	A	601	QXD	C20-C21-S22-C23
2	A	601	QXD	C10-C02-C04-O05
2	A	601	QXD	C29-N28-S25-O27
2	B	601	QXD	C03-C02-C10-O11
2	B	601	QXD	C04-C02-C10-O11
2	B	601	QXD	C01-C02-C10-O11
2	B	601	QXD	N14-C15-C16-C17
2	B	601	QXD	C20-C21-S22-C23
2	B	601	QXD	C24-C23-S22-C21
2	B	601	QXD	N28-C29-C30-C45
2	B	601	QXD	C10-C12-N14-C15
2	C	601	QXD	C02-C10-C12-O13
2	C	601	QXD	C02-C10-C12-N14
2	C	601	QXD	O11-C10-C12-O13
2	C	601	QXD	O11-C10-C12-N14
2	C	601	QXD	N19-C20-C21-S22
2	C	601	QXD	C10-C02-C04-O05

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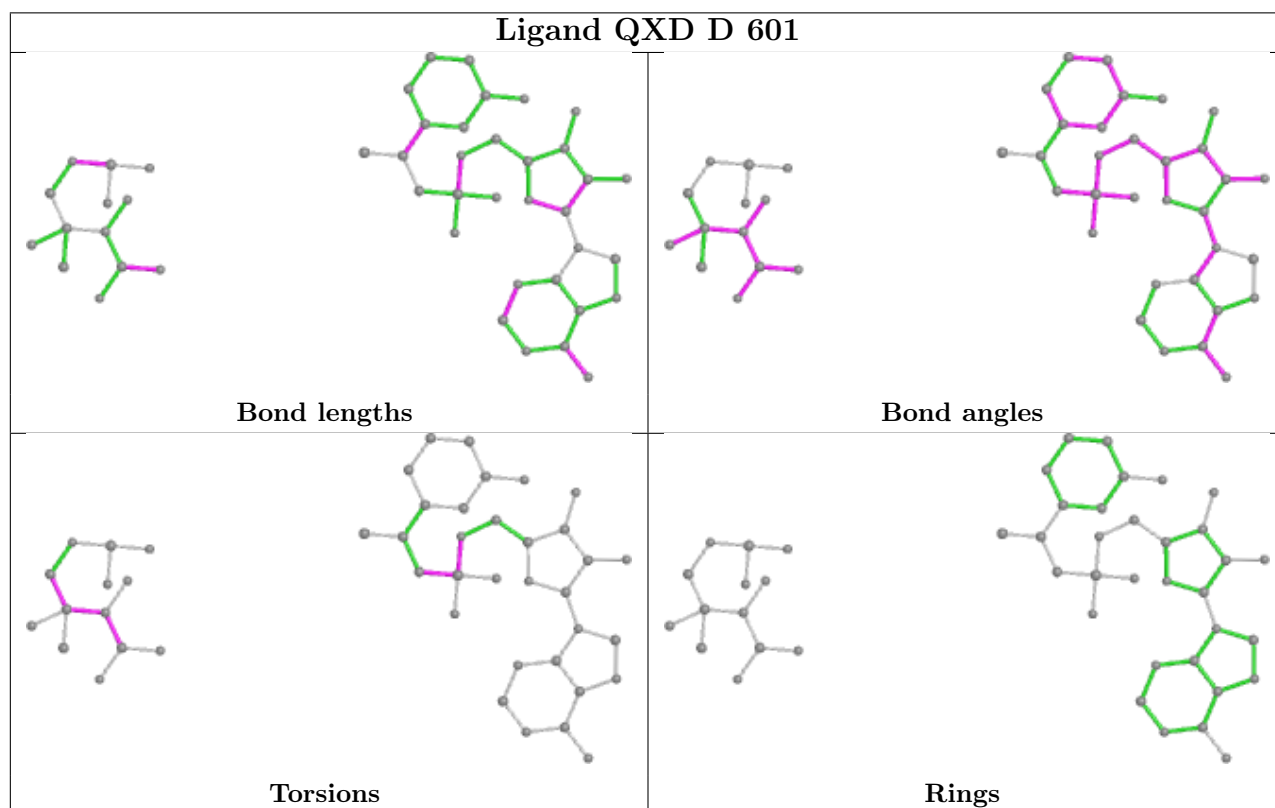
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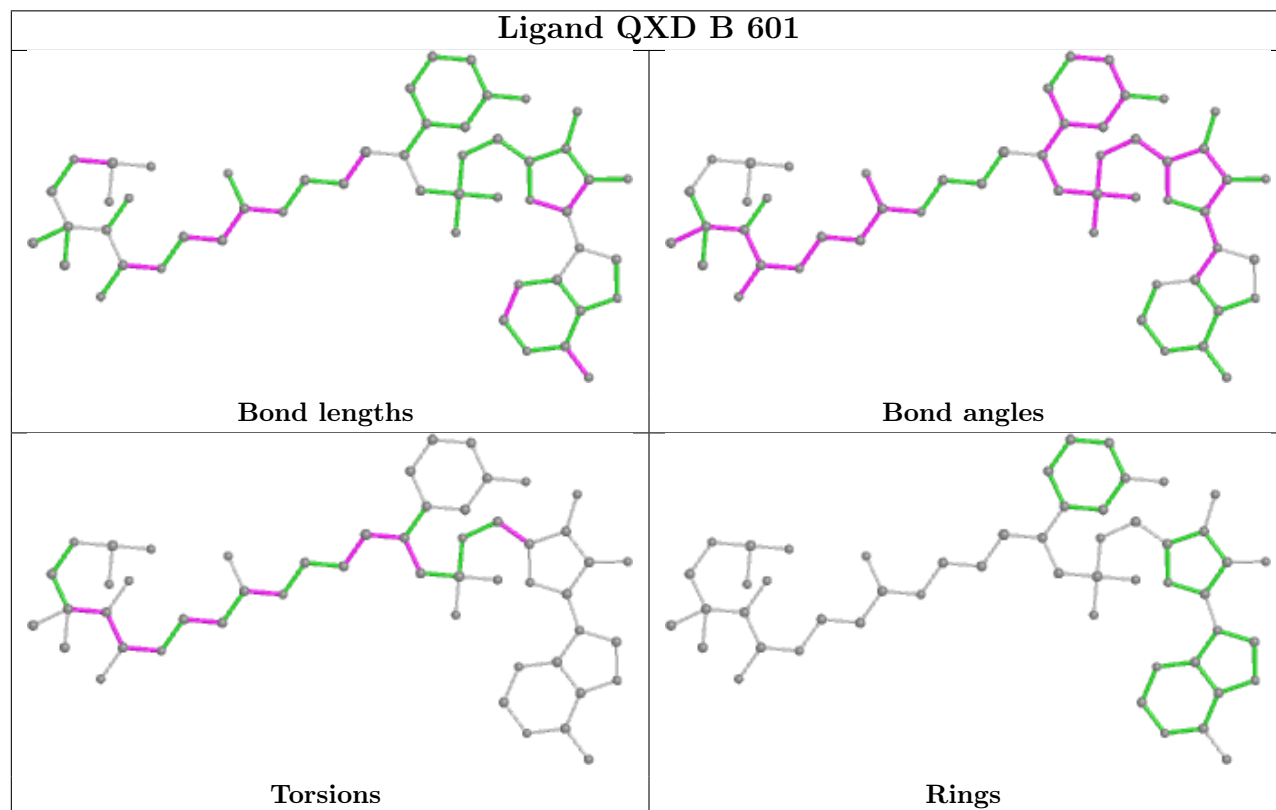
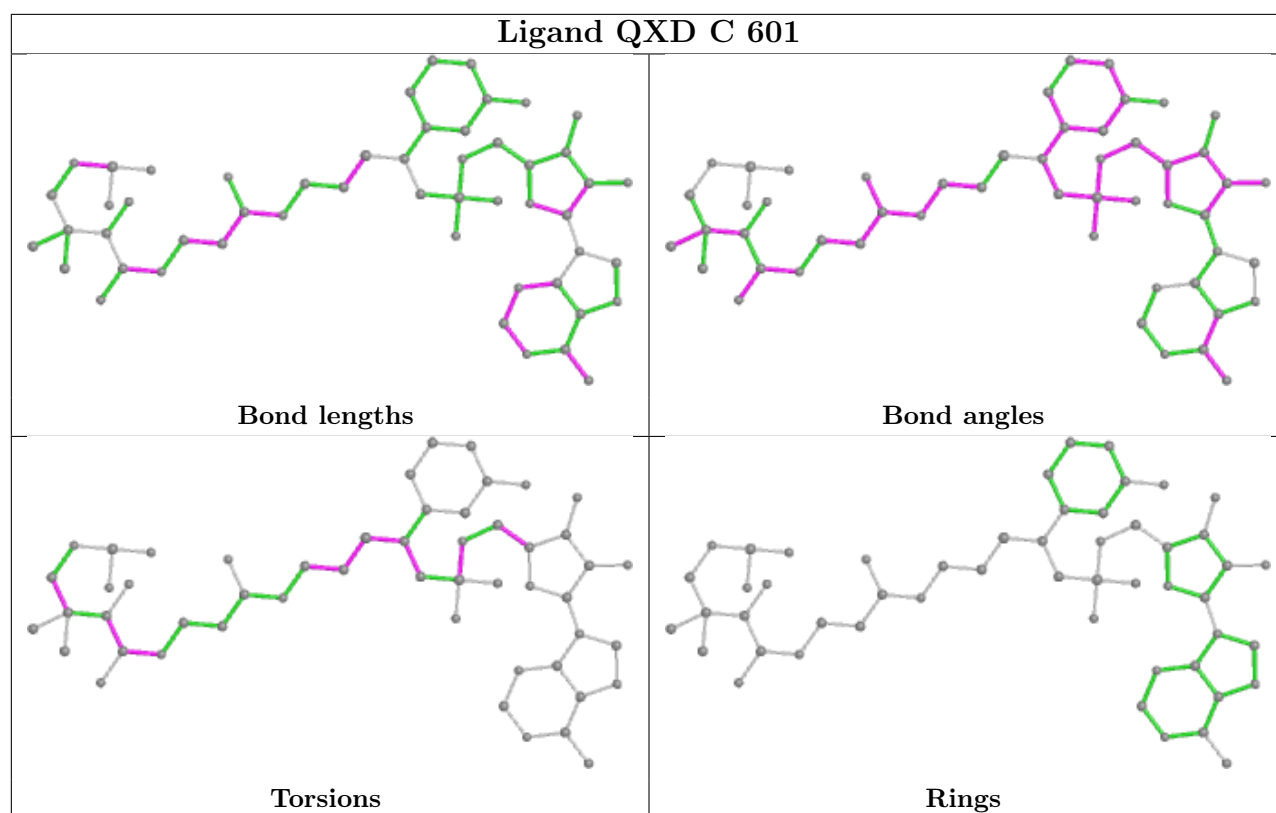
Mol	Chain	Res	Type	Atoms
2	C	601	QXD	C03-C02-C04-O05
2	C	601	QXD	C01-C02-C04-O05
2	C	601	QXD	C24-C23-S22-C21
2	C	601	QXD	N28-C29-C30-O31
2	C	601	QXD	N28-C29-C30-C45
2	C	601	QXD	C10-C12-N14-C15
2	C	601	QXD	C29-N28-S25-O26
2	D	601	QXD	C03-C02-C10-C12
2	D	601	QXD	C04-C02-C10-C12
2	D	601	QXD	C01-C02-C10-C12
2	D	601	QXD	C03-C02-C10-O11
2	D	601	QXD	C04-C02-C10-O11
2	D	601	QXD	C01-C02-C10-O11
2	D	601	QXD	C23-C24-S25-N28
2	D	601	QXD	C23-C24-S25-O26
2	D	601	QXD	C23-C24-S25-O27
2	D	601	QXD	C10-C02-C04-O05
2	D	601	QXD	C03-C02-C04-O05
2	D	601	QXD	C01-C02-C04-O05
2	D	601	QXD	C29-N28-S25-O27
2	A	601	QXD	C16-C17-N19-C20
2	B	601	QXD	C16-C17-N19-C20
2	B	601	QXD	O13-C12-N14-C15
2	C	601	QXD	O13-C12-N14-C15
2	A	601	QXD	O18-C17-N19-C20
2	B	601	QXD	O18-C17-N19-C20
2	C	601	QXD	C29-N28-S25-C24
2	D	601	QXD	C29-N28-S25-C24
2	A	601	QXD	C03-C02-C04-O05
2	A	601	QXD	C01-C02-C04-O05
2	B	601	QXD	C02-C10-C12-O13
2	A	601	QXD	C02-C10-C12-N14
2	B	601	QXD	C02-C10-C12-N14
2	C	601	QXD	C20-C21-S22-C23
2	A	601	QXD	C02-C10-C12-O13
2	B	601	QXD	N28-C29-C30-O31
2	D	601	QXD	O11-C10-C12-N14
2	B	601	QXD	C47-C23-C24-S25
2	C	601	QXD	C47-C23-C24-S25
2	B	601	QXD	C47-C23-S22-C21
2	C	601	QXD	C47-C23-S22-C21

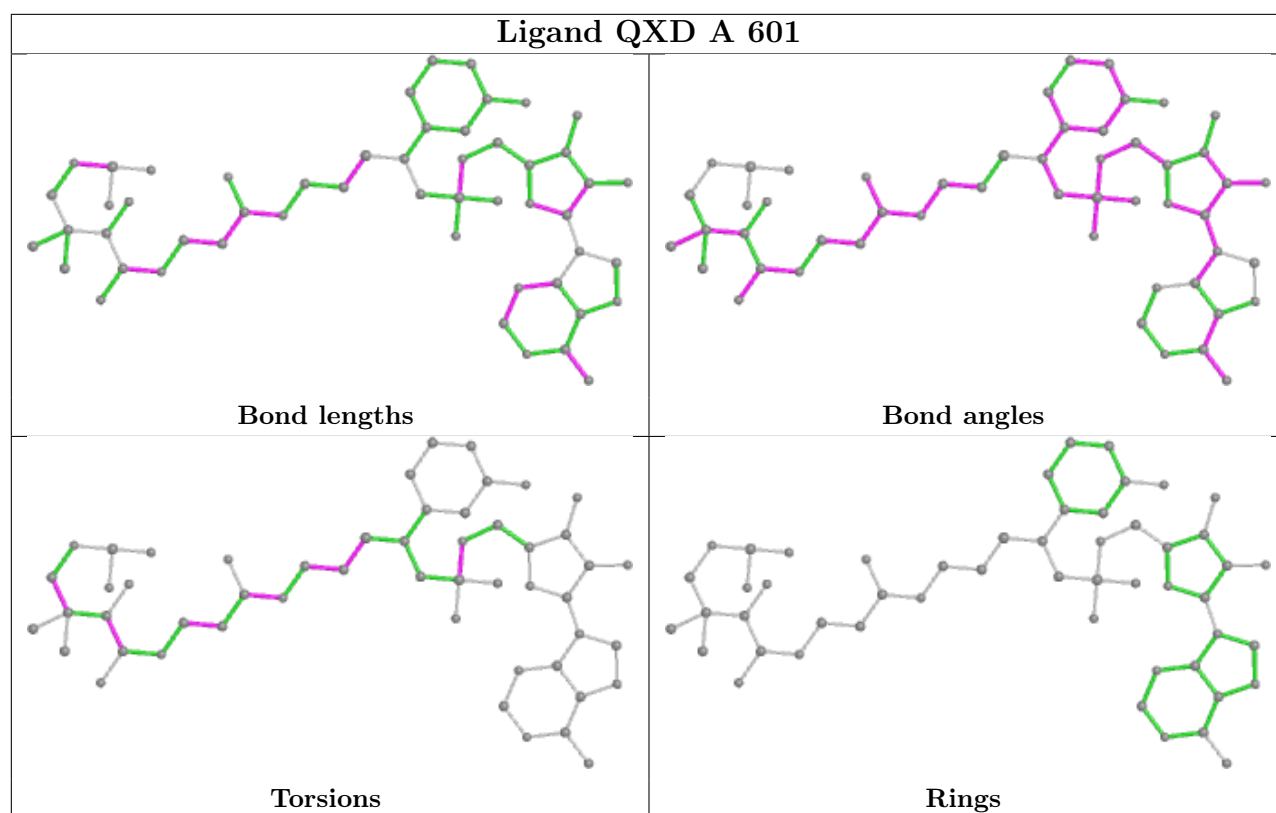
There are no ring outliers.

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.







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

There are no such residues in this entry.

#### 4.8 Polymer linkage issues [\(i\)](#)

There are no chain breaks in this entry.

## 5 Fit of model and data [i](#)

### 5.1 Protein, DNA and RNA chains [i](#)

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

### 5.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

### 5.3 Carbohydrates [i](#)

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

### 5.4 Ligands [i](#)

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

### 5.5 Other polymers [i](#)

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