



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 3, 2023 – 04:47 AM EDT

PDB ID : 6OAAQ  
Title : Crystal structure of a dual sensor histidine kinase in BeF3- bound state  
Authors : Heewhan, S.; Zhong, R.; Xiaoli, Z.; Sepalika, B.; Xiaojing, Y.  
Deposited on : 2019-03-18  
Resolution : 2.54 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)  
Xtrriage (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 2.54 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](#)

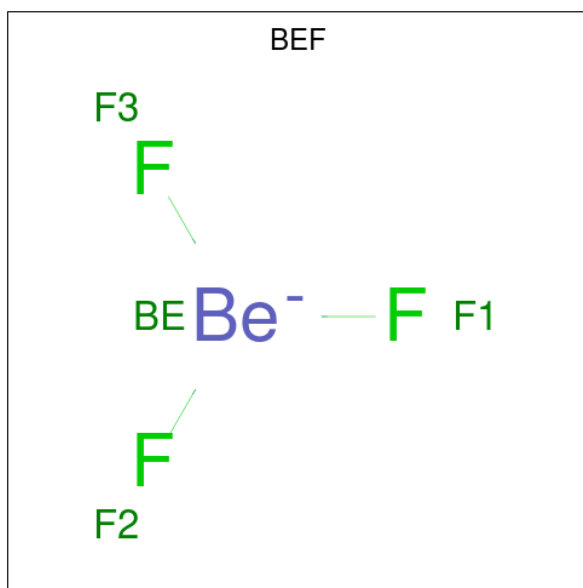
There are 5 unique types of molecules in this entry. The entry contains 5016 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Dual sensor histidine kinase.

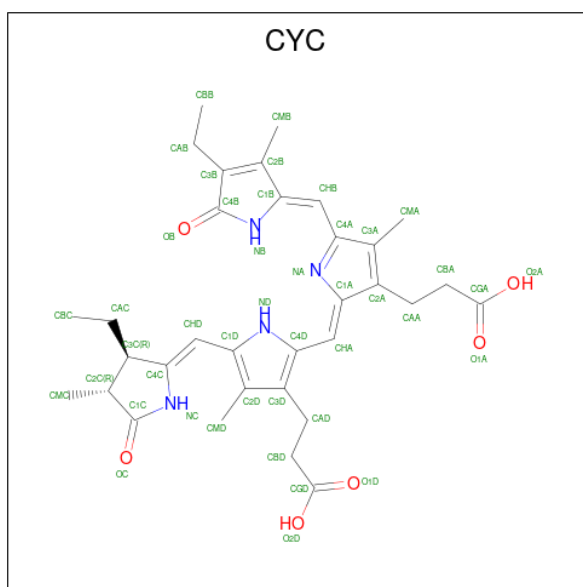
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	302	Total 2441	C 1545	N 433	O 458	S 5	0	1	0
1	B	301	Total 2429	C 1540	N 428	O 456	S 5	0	0	0

- Molecule 2 is BERYLLIUM TRIFLUORIDE ION (three-letter code: BEF) (formula: BeF<sub>3</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	Be	F		
2	A	1	Total 4	Be 1	F 3	0	0

- Molecule 3 is PHYCOCYANOBILIN (three-letter code: CYC) (formula: C<sub>33</sub>H<sub>40</sub>N<sub>4</sub>O<sub>6</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			43	33	4	6		
3	B	1	Total	C	N	O	0	0
			43	33	4	6		

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Mg	0	0
			1	1		
4	B	3	Total	Mg	0	0
			3	3		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	24	Total	O	0	0
			24	24		
5	B	28	Total	O	0	0
			28	28		

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 43 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	73.53Å 73.53Å 253.59Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	44.28 – 2.54	Depositor
% Data completeness (in resolution range)	87.4 (44.28-2.54)	Depositor
$R_{merge}$	0.08	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.98 (at 2.54Å)	Xtrriage
Refinement program	PHENIX 1.9_1692	Depositor
R, $R_{free}$	0.191 , 0.241	Depositor
Wilson B-factor (Å <sup>2</sup> )	65.9	Xtrriage
Anisotropy	0.384	Xtrriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	5016	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	84.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.85% 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](#)

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### 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](#)

Of 7 ligands modelled in this entry, 4 are monoatomic - leaving 3 for Mogul analysis.

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	BEF	A	401	4,1	0,3,3	-	-	-		
3	CYC	A	402	-	42,46,46	4.77	15 (35%)	50,67,67	2.27	20 (40%)
3	CYC	B	401	-	42,46,46	4.72	15 (35%)	50,67,67	2.35	22 (44%)

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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	CYC	B	401	-	-	11/25/74/74	0/4/4/4
3	CYC	A	402	-	-	12/25/74/74	0/4/4/4

All (30) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	402	CYC	C2C-C1C	-21.23	1.33	1.52
3	B	401	CYC	C2C-C1C	-21.16	1.33	1.52
3	A	402	CYC	C3C-C4C	-11.65	1.33	1.50
3	B	401	CYC	C3C-C4C	-11.18	1.34	1.50
3	A	402	CYC	C4B-C3B	-8.04	1.32	1.48
3	B	401	CYC	C4B-C3B	-7.99	1.33	1.48
3	A	402	CYC	C2C-C3C	-7.61	1.33	1.54
3	A	402	CYC	C1A-C2A	-7.59	1.33	1.45
3	B	401	CYC	C1A-C2A	-7.51	1.33	1.45
3	B	401	CYC	C2C-C3C	-7.43	1.33	1.54
3	B	401	CYC	OB-C4B	6.85	1.36	1.23
3	A	402	CYC	OB-C4B	6.71	1.36	1.23
3	A	402	CYC	C1B-C2B	-5.29	1.35	1.45
3	B	401	CYC	C1B-C2B	-5.21	1.35	1.45
3	A	402	CYC	C4A-C3A	-4.84	1.35	1.45
3	B	401	CYC	C4A-C3A	-4.78	1.35	1.45
3	B	401	CYC	CBB-CAB	-4.16	1.32	1.51
3	A	402	CYC	CBB-CAB	-4.14	1.33	1.51
3	B	401	CYC	C1C-NC	-2.75	1.34	1.37
3	A	402	CYC	C1C-NC	-2.71	1.34	1.37
3	A	402	CYC	C1B-NB	-2.51	1.33	1.37
3	A	402	CYC	CHB-C4A	-2.46	1.34	1.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	402	CYC	C1A-NA	-2.43	1.33	1.38
3	B	401	CYC	CHB-C4A	-2.39	1.34	1.40
3	B	401	CYC	C1B-NB	-2.27	1.34	1.37
3	B	401	CYC	C1A-NA	-2.24	1.33	1.38
3	A	402	CYC	C4B-NB	-2.19	1.33	1.38
3	B	401	CYC	C4C-NC	-2.04	1.33	1.37
3	A	402	CYC	C4C-NC	-2.03	1.33	1.37
3	B	401	CYC	C4B-NB	-2.02	1.33	1.38

All (42) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	401	CYC	CMB-C2B-C1B	5.86	131.49	124.17
3	A	402	CYC	CMB-C2B-C1B	5.70	131.29	124.17
3	B	401	CYC	C2C-C3C-C4C	5.12	109.00	101.34
3	A	402	CYC	C2C-C3C-C4C	4.81	108.55	101.34
3	B	401	CYC	C4D-CHA-C1A	-4.32	123.64	128.81
3	A	402	CYC	C4D-CHA-C1A	-4.23	123.75	128.81
3	B	401	CYC	CAB-C3B-C4B	4.18	127.98	121.38
3	B	401	CYC	CMA-C3A-C4A	4.02	131.25	125.06
3	A	402	CYC	CAB-C3B-C4B	3.84	127.44	121.38
3	A	402	CYC	CMA-C3A-C4A	3.68	130.73	125.06
3	A	402	CYC	CMC-C2C-C1C	3.51	119.97	112.40
3	B	401	CYC	CAC-C3C-C4C	3.48	121.61	112.67
3	B	401	CYC	C2C-C1C-NC	3.44	111.24	108.27
3	A	402	CYC	CAC-C3C-C4C	3.38	121.36	112.67
3	A	402	CYC	CHD-C4C-NC	3.27	129.09	125.20
3	B	401	CYC	CHD-C4C-NC	3.25	129.07	125.20
3	B	401	CYC	CMC-C2C-C1C	3.22	119.35	112.40
3	A	402	CYC	C2C-C1C-NC	3.21	111.04	108.27
3	B	401	CYC	OC-C1C-C2C	-3.19	123.64	126.17
3	A	402	CYC	OC-C1C-C2C	-3.03	123.76	126.17
3	A	402	CYC	OB-C4B-C3B	2.92	131.21	128.04
3	A	402	CYC	CAC-C3C-C2C	2.84	121.36	114.26
3	B	401	CYC	CAA-C2A-C3A	-2.79	122.68	127.88
3	A	402	CYC	CHB-C1B-NB	-2.78	120.09	126.06
3	B	401	CYC	OB-C4B-C3B	2.75	131.03	128.04
3	B	401	CYC	CAC-C3C-C2C	2.69	120.97	114.26
3	B	401	CYC	CMB-C2B-C3B	-2.38	119.67	126.12
3	B	401	CYC	CAB-C3B-C2B	-2.36	123.49	127.53
3	B	401	CYC	C3A-C4A-NA	-2.32	105.57	110.53
3	B	401	CYC	CBC-CAC-C3C	-2.32	108.31	113.47

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	401	CYC	CAD-CBD-CGD	-2.32	107.27	113.76
3	B	401	CYC	CAA-C2A-C1A	2.32	129.10	125.01
3	B	401	CYC	CMA-C3A-C2A	-2.29	119.91	126.12
3	A	402	CYC	CAD-CBD-CGD	-2.24	107.49	113.76
3	A	402	CYC	CAA-C2A-C3A	-2.23	123.72	127.88
3	B	401	CYC	CHB-C1B-NB	-2.22	121.29	126.06
3	A	402	CYC	C3A-C4A-NA	-2.16	105.91	110.53
3	A	402	CYC	CMB-C2B-C3B	-2.15	120.28	126.12
3	A	402	CYC	CHB-C4A-NA	-2.14	120.47	124.93
3	A	402	CYC	CAB-C3B-C2B	-2.02	124.07	127.53
3	A	402	CYC	CHB-C4A-C3A	2.02	130.09	124.90
3	B	401	CYC	O1D-CGD-CBD	-2.01	116.61	123.08

There are no chirality outliers.

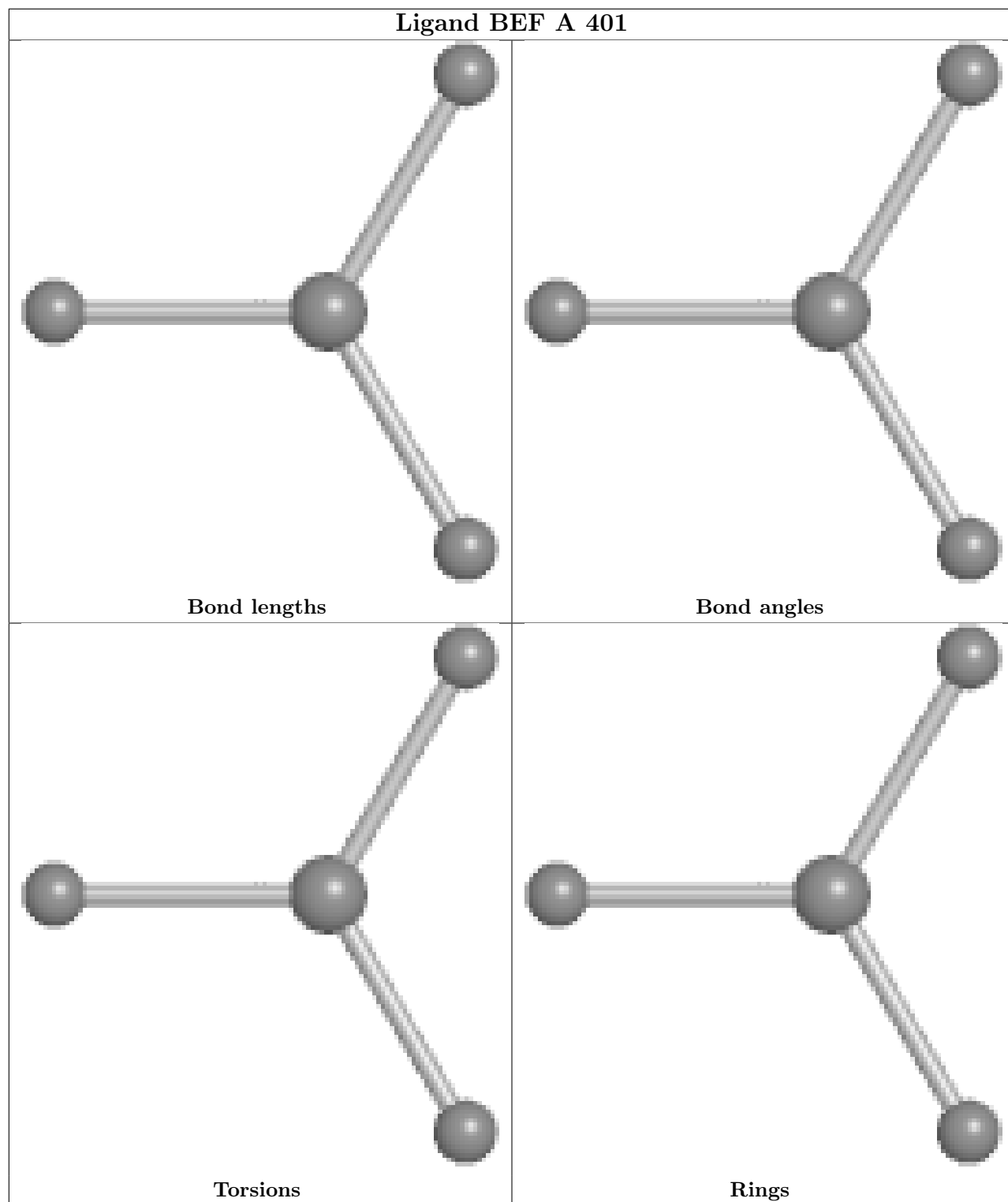
All (23) torsion outliers are listed below:

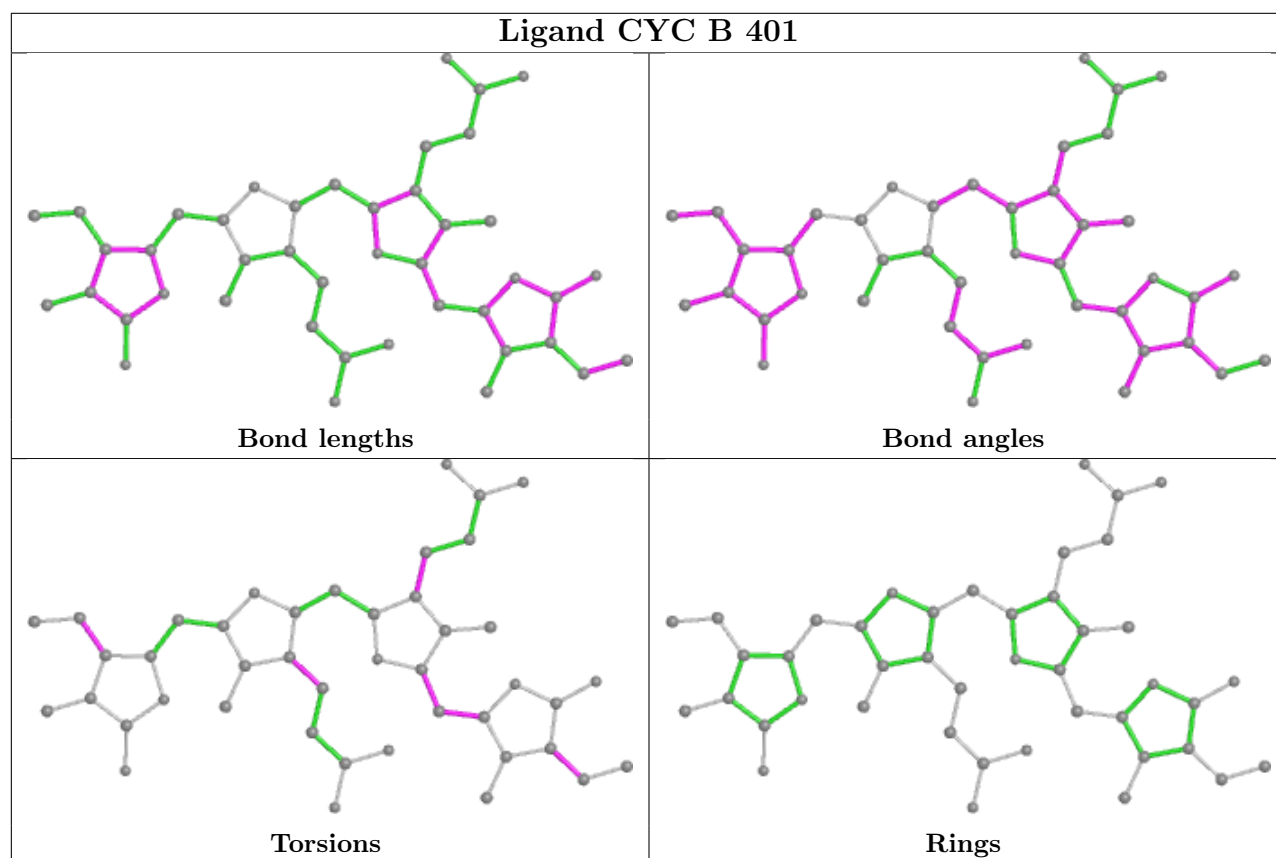
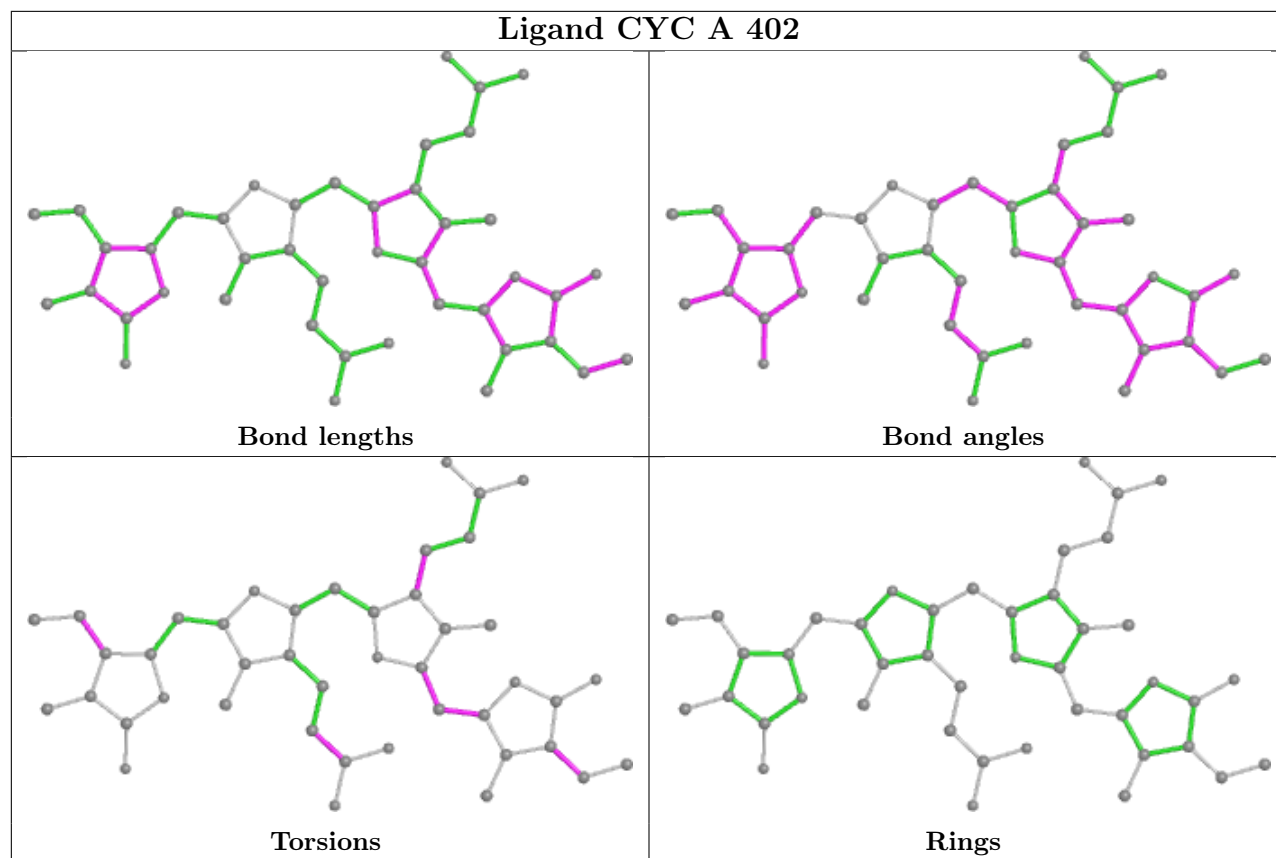
Mol	Chain	Res	Type	Atoms
3	A	402	CYC	C3A-C4A-CHB-C1B
3	A	402	CYC	C2B-C1B-CHB-C4A
3	A	402	CYC	C2B-C3B-CAB-CBB
3	A	402	CYC	C4B-C3B-CAB-CBB
3	A	402	CYC	C2C-C3C-CAC-CBC
3	A	402	CYC	C4C-C3C-CAC-CBC
3	B	401	CYC	C3A-C4A-CHB-C1B
3	B	401	CYC	C2B-C1B-CHB-C4A
3	B	401	CYC	C2B-C3B-CAB-CBB
3	B	401	CYC	C4B-C3B-CAB-CBB
3	B	401	CYC	C2C-C3C-CAC-CBC
3	B	401	CYC	C4C-C3C-CAC-CBC
3	A	402	CYC	NB-C1B-CHB-C4A
3	B	401	CYC	NB-C1B-CHB-C4A
3	A	402	CYC	NA-C4A-CHB-C1B
3	B	401	CYC	NA-C4A-CHB-C1B
3	B	401	CYC	C1A-C2A-CAA-CBA
3	B	401	CYC	C2D-C3D-CAD-CBD
3	B	401	CYC	C3A-C2A-CAA-CBA
3	A	402	CYC	CAD-CBD-CGD-O2D
3	A	402	CYC	C3A-C2A-CAA-CBA
3	A	402	CYC	CAD-CBD-CGD-O1D
3	A	402	CYC	C1A-C2A-CAA-CBA

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

### 5.1 Protein, DNA and RNA chains

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

### 5.2 Non-standard residues in protein, DNA, RNA chains

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

### 5.3 Carbohydrates

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

### 5.4 Ligands

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

### 5.5 Other polymers

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