



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 5, 2023 – 03:26 AM EDT

PDB ID : 6VND
Title : Quaternary Complex of human dihydroorotate dehydrogenase (DHODH) with flavin mononucleotide (FMN), orotic acid and AG-636
Authors : Padyana, A.; Jin, L.
Deposited on : 2020-01-29
Resolution : 1.97 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 : **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 1.97 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 11 unique types of molecules in this entry. The entry contains 3256 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.

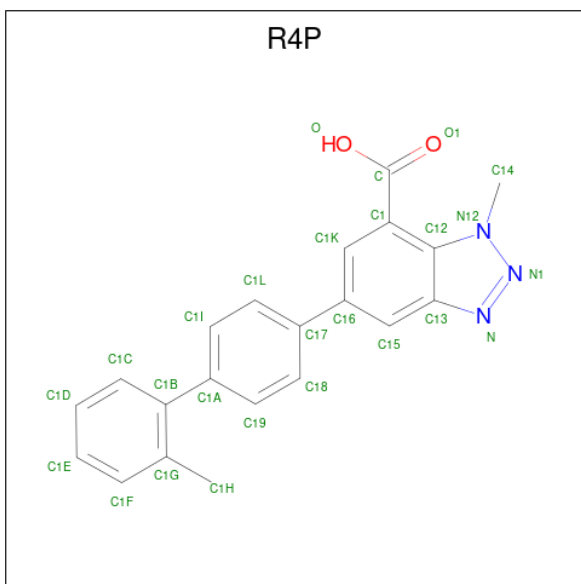
- Molecule 1 is a protein called Dihydroorotate dehydrogenase (quinone), mitochondrial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	365	2810	1766	517	523	4	6	5	0

There is a discrepancy between the modelled and reference sequences:

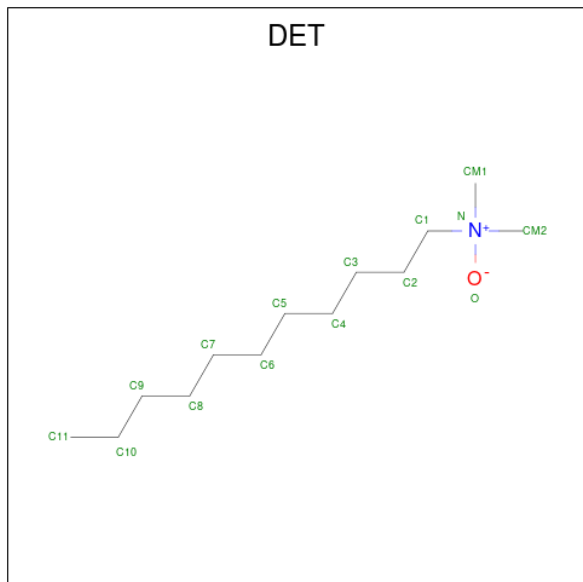
Chain	Residue	Modelled	Actual	Comment	Reference
A	28	GLY	-	cloning artifact	UNP Q02127

- Molecule 2 is 1-methyl-5-(2'-methyl[1,1'-biphenyl]-4-yl)-1H-benzotriazole-7-carboxylic acid (three-letter code: R4P) (formula: C₂₁H₁₇N₃O₂) (labeled as "Ligand of Interest" by depositor).



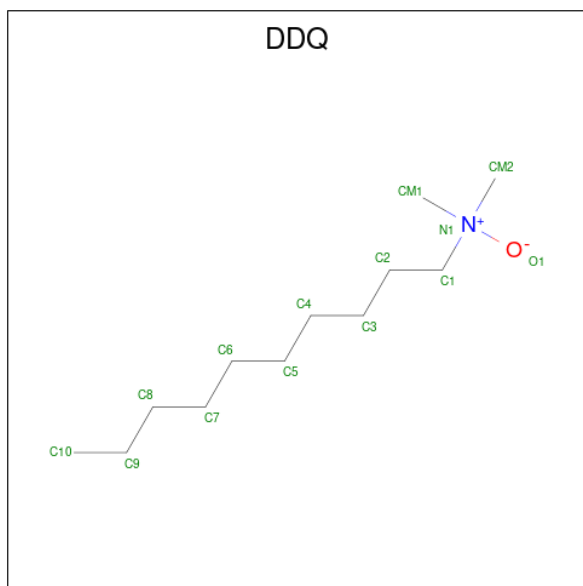
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	A	1	52	42	6	4	0	1

- Molecule 3 is UNDECYLAMINE-N,N-DIMETHYL-N-OXIDE (three-letter code: DET) (formula: $C_{13}H_{29}NO$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
3	A	1	15	13	1	1	0	0
3	A	1	Total	C	N	O	0	0
			15	13	1	1		

- Molecule 4 is DECYLAMINE-N,N-DIMETHYL-N-OXIDE (three-letter code: DDQ) (formula: $C_{12}H_{27}NO$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	0
			14	12	1	1		
4	A	1	Total	C	N	O	0	1
			28	24	2	2		

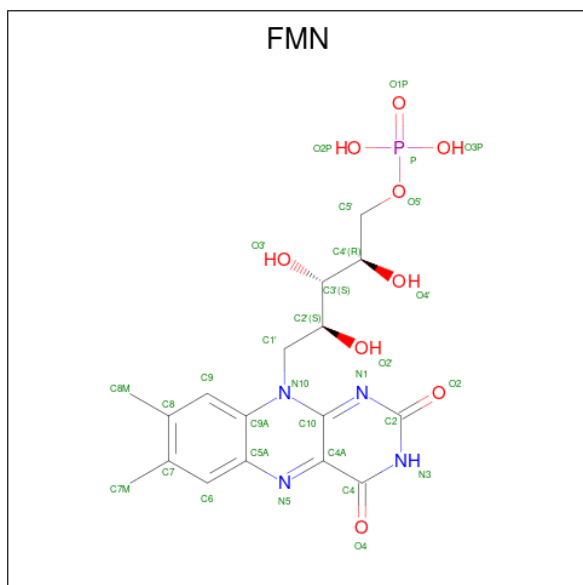
- Molecule 5 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total	Cl	0	0
			1	1		

- Molecule 6 is SODIUM ION (three-letter code: NA) (formula: Na).

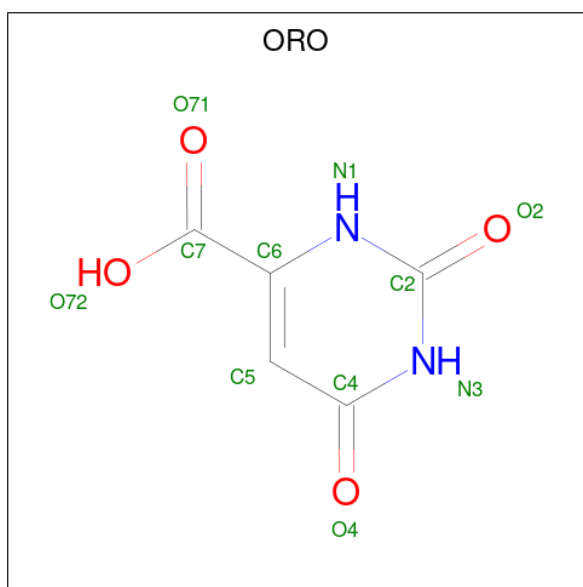
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	3	Total	Na	0	0
			3	3		

- Molecule 7 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: C₁₇H₂₁N₄O₉P).



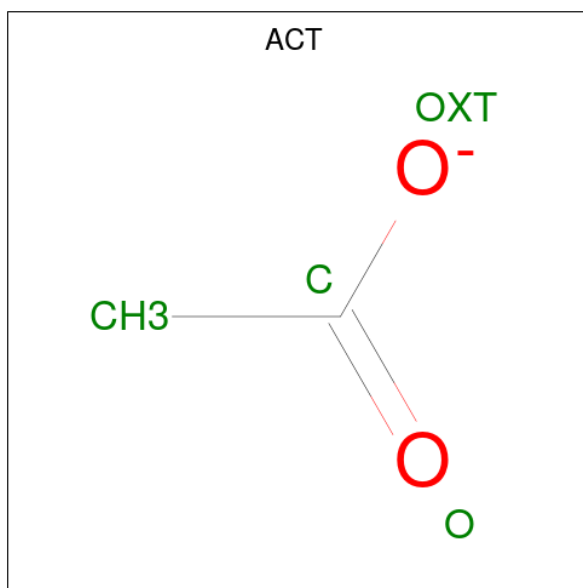
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
7	A	1	Total	C	N	O	P	0	0
			31	17	4	9	1		

- Molecule 8 is OROTIC ACID (three-letter code: ORO) (formula: C₅H₄N₂O₄).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
8	A	1	11	5	2	4	0	0

- Molecule 9 is ACETATE ION (three-letter code: ACT) (formula: $C_2H_3O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
9	A	1	4	2	2	0	0
9	A	1	4	2	2	0	0
9	A	1	4	2	2	0	0

- Molecule 10 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
10	A	1	Total C O 6 3 3	0	0
10	A	1	Total C O 6 3 3	0	0
10	A	1	Total C O 6 3 3	0	0
10	A	1	Total C O 6 3 3	0	0
10	A	1	Total C O 6 3 3	0	0
10	A	1	Total C O 6 3 3	0	0

- Molecule 11 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
11	A	228	Total O 228 228	0	0

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

3 Data and refinement statistics i

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

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α , β , γ	90.53Å 90.53Å 123.76Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	28.78 – 1.97	Depositor
% Data completeness (in resolution range)	92.7 (28.78-1.97)	Depositor
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.82 (at 1.97Å)	Xtrriage
Refinement program	PHENIX 1.17.1_3660	Depositor
R, R_{free}	0.155 , 0.190	Depositor
Wilson B-factor (Å ²)	28.8	Xtrriage
Anisotropy	0.120	Xtrriage
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.024 for -h,-k,l	Xtrriage
Total number of atoms	3256	wwPDB-VP
Average B, all atoms (Å ²)	37.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.03% 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.

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](#)

Of 22 ligands modelled in this entry, 4 are monoatomic - leaving 18 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
10	GOL	A	415	-	5,5,5	0.18	0	5,5,5	0.36	0
2	R4P	A	401[B]	-	26,29,29	1.48	3 (11%)	33,42,42	1.50	5 (15%)
10	GOL	A	417	-	5,5,5	0.37	0	5,5,5	0.55	0
10	GOL	A	416	-	5,5,5	0.48	0	5,5,5	0.59	0
10	GOL	A	419	-	5,5,5	0.08	0	5,5,5	0.21	0
3	DET	A	403	-	11,14,14	0.48	0	13,16,16	0.45	0
4	DDQ	A	405[B]	-	10,13,13	0.37	0	12,15,15	0.55	0
10	GOL	A	420	-	5,5,5	0.14	0	5,5,5	0.16	0
7	FMN	A	410	-	33,33,33	0.82	1 (3%)	48,50,50	0.54	0
4	DDQ	A	404	-	10,13,13	0.38	0	12,15,15	0.43	0
9	ACT	A	414	-	3,3,3	1.17	0	3,3,3	1.00	0
2	R4P	A	401[A]	-	26,29,29	1.60	4 (15%)	33,42,42	2.02	10 (30%)
10	GOL	A	418	-	5,5,5	0.14	0	5,5,5	0.23	0
9	ACT	A	412	-	3,3,3	0.99	0	3,3,3	0.97	0
8	ORO	A	411	-	9,11,11	1.72	2 (22%)	8,15,15	3.09	2 (25%)
4	DDQ	A	405[A]	-	10,13,13	0.37	0	12,15,15	0.67	1 (8%)
3	DET	A	402	6	11,14,14	0.44	0	13,16,16	1.24	2 (15%)
9	ACT	A	413	-	3,3,3	1.34	0	3,3,3	0.71	0

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
10	GOL	A	415	-	-	3/4/4/4	-
2	R4P	A	401[B]	-	-	0/12/12/12	0/4/4/4
10	GOL	A	417	-	-	0/4/4/4	-
10	GOL	A	416	-	-	0/4/4/4	-
3	DET	A	403	-	-	7/12/12/12	-
4	DDQ	A	405[B]	-	-	5/11/11/11	-
10	GOL	A	420	-	-	2/4/4/4	-
7	FMN	A	410	-	-	4/18/18/18	0/3/3/3
4	DDQ	A	404	-	-	4/11/11/11	-
2	R4P	A	401[A]	-	-	0/12/12/12	0/4/4/4
10	GOL	A	418	-	-	0/4/4/4	-

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
8	ORO	A	411	-	-	4/4/4/4	0/1/1/1
4	DDQ	A	405[A]	-	-	8/11/11/11	-
3	DET	A	402	6	-	7/12/12/12	-
10	GOL	A	419	-	-	2/4/4/4	-

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401[B]	R4P	C1B-C1A	-4.95	1.40	1.49
2	A	401[A]	R4P	C1B-C1A	-4.83	1.40	1.49
8	A	411	ORO	C4-N3	4.08	1.40	1.33
2	A	401[A]	R4P	C16-C17	-4.07	1.38	1.49
2	A	401[B]	R4P	C16-C17	-3.98	1.39	1.49
2	A	401[A]	R4P	N1-N12	3.35	1.41	1.34
7	A	410	FMN	P-O5'	2.79	1.69	1.60
8	A	411	ORO	C6-N1	2.30	1.37	1.34
2	A	401[A]	R4P	O-C	-2.11	1.24	1.30
2	A	401[B]	R4P	N1-N12	2.03	1.38	1.34

All (20) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	A	411	ORO	C5-C4-N3	-7.27	115.60	124.08
2	A	401[A]	R4P	C1K-C1-C	-5.61	111.94	118.27
8	A	411	ORO	C6-C5-C4	4.56	119.67	116.73
2	A	401[B]	R4P	C1K-C1-C	-4.24	113.48	118.27
2	A	401[A]	R4P	C15-C13-C12	-3.79	117.30	121.12
2	A	401[A]	R4P	C16-C15-C13	3.52	124.51	121.44
2	A	401[A]	R4P	C1A-C1B-C1G	3.32	129.26	122.48
3	A	402	DET	CM2-N-C1	-3.13	103.65	110.23
2	A	401[B]	R4P	C14-N12-N1	3.09	121.91	117.67
3	A	402	DET	CM1-N-C1	3.06	116.67	110.23
2	A	401[A]	R4P	C1K-C16-C17	2.97	125.77	120.86
2	A	401[B]	R4P	C1I-C1A-C1B	-2.94	116.14	120.91
2	A	401[A]	R4P	C1C-C1B-C1A	-2.85	113.05	118.68
2	A	401[A]	R4P	C15-C16-C17	-2.84	114.56	121.05
2	A	401[A]	R4P	C12-C13-N	2.67	111.81	108.63
2	A	401[A]	R4P	C14-N12-N1	2.64	121.30	117.67
2	A	401[B]	R4P	O-C-O1	-2.63	117.51	123.35
2	A	401[B]	R4P	C19-C1A-C1B	2.55	125.04	120.91
2	A	401[A]	R4P	O-C-O1	-2.22	118.43	123.35

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	405[A]	DDQ	CM2-N1-C1	-2.07	105.88	110.23

There are no chirality outliers.

All (46) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	402	DET	C2-C1-N-CM2
3	A	403	DET	C2-C1-N-O
3	A	403	DET	C2-C1-N-CM2
3	A	403	DET	N-C1-C2-C3
4	A	404	DDQ	N1-C1-C2-C3
4	A	405[A]	DDQ	C2-C1-N1-O1
4	A	405[A]	DDQ	C2-C1-N1-CM2
4	A	405[B]	DDQ	C2-C1-N1-O1
4	A	405[B]	DDQ	C2-C1-N1-CM2
8	A	411	ORO	N1-C6-C7-O72
8	A	411	ORO	C5-C6-C7-O71
8	A	411	ORO	C5-C6-C7-O72
10	A	415	GOL	O1-C1-C2-C3
4	A	405[B]	DDQ	C6-C7-C8-C9
8	A	411	ORO	N1-C6-C7-O71
7	A	410	FMN	O3'-C3'-C4'-O4'
3	A	403	DET	C6-C7-C8-C9
7	A	410	FMN	C2'-C3'-C4'-O4'
3	A	403	DET	C4-C5-C6-C7
10	A	415	GOL	C1-C2-C3-O3
10	A	420	GOL	C1-C2-C3-O3
3	A	402	DET	C5-C6-C7-C8
4	A	404	DDQ	C5-C6-C7-C8
10	A	415	GOL	O1-C1-C2-O2
4	A	404	DDQ	C1-C2-C3-C4
4	A	405[A]	DDQ	C5-C6-C7-C8
3	A	402	DET	C1-C2-C3-C4
4	A	404	DDQ	C2-C3-C4-C5
3	A	403	DET	C1-C2-C3-C4
10	A	420	GOL	O2-C2-C3-O3
4	A	405[A]	DDQ	C7-C8-C9-C10
10	A	419	GOL	C1-C2-C3-O3
4	A	405[A]	DDQ	C3-C4-C5-C6
4	A	405[B]	DDQ	C3-C4-C5-C6
3	A	402	DET	C6-C7-C8-C9
3	A	402	DET	C3-C4-C5-C6

Continued on next page...

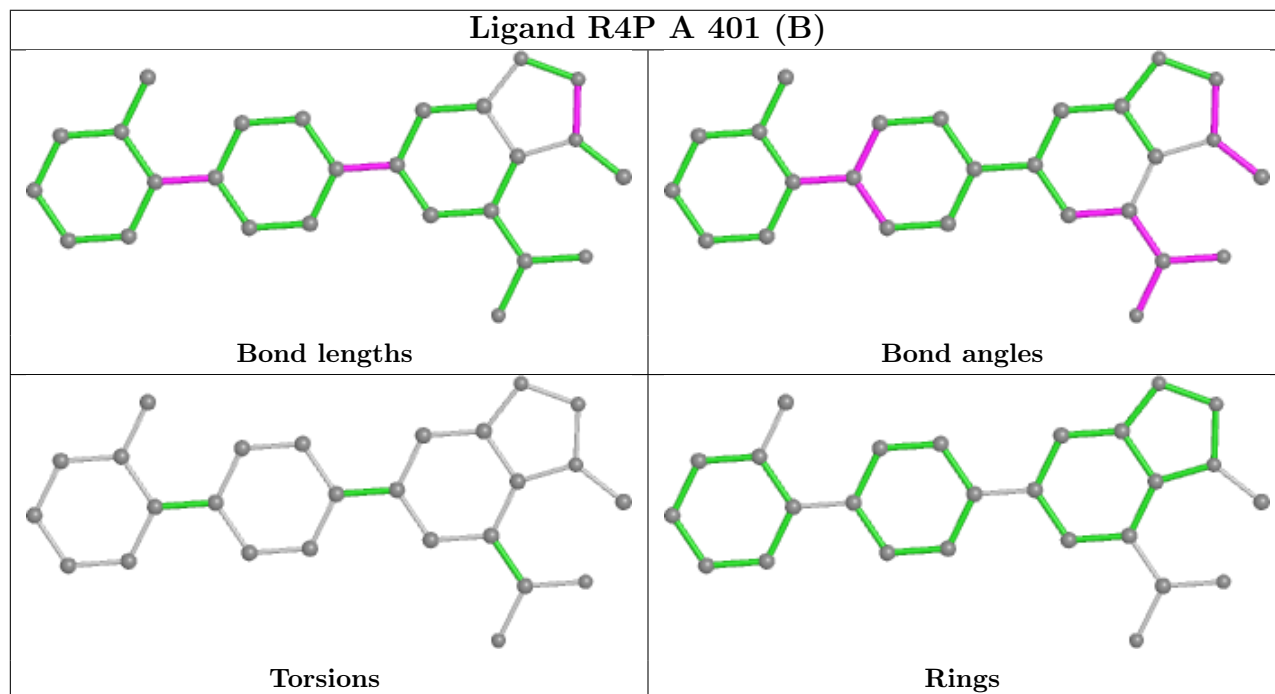
Continued from previous page...

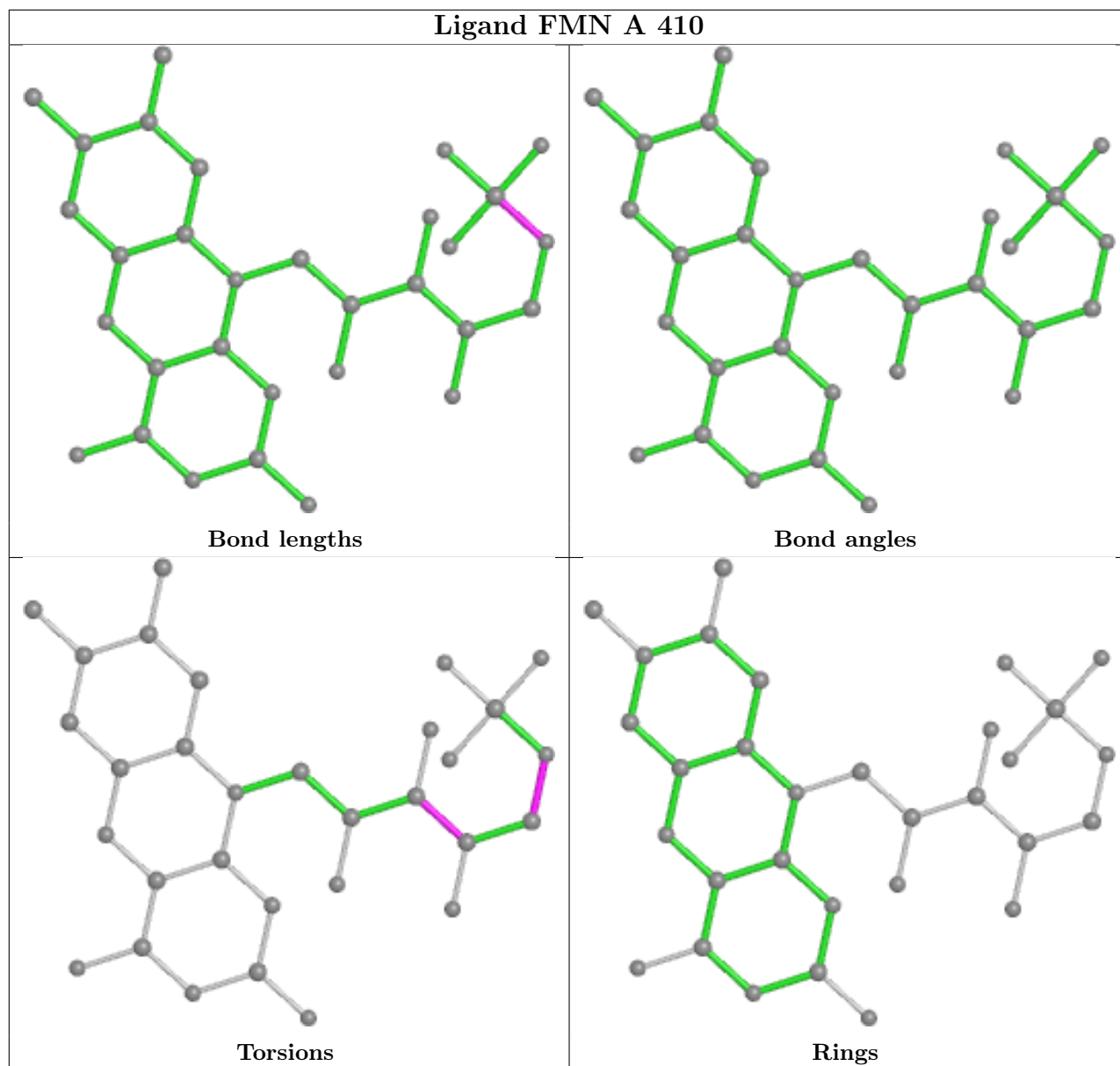
Mol	Chain	Res	Type	Atoms
4	A	405[B]	DDQ	C1-C2-C3-C4
3	A	402	DET	C2-C1-N-CM1
3	A	403	DET	C2-C1-N-CM1
7	A	410	FMN	C4'-C5'-O5'-P
7	A	410	FMN	O3'-C3'-C4'-C5'
4	A	405[A]	DDQ	C1-C2-C3-C4
4	A	405[A]	DDQ	C4-C5-C6-C7
4	A	405[A]	DDQ	C6-C7-C8-C9
3	A	402	DET	C4-C5-C6-C7
10	A	419	GOL	O1-C1-C2-C3

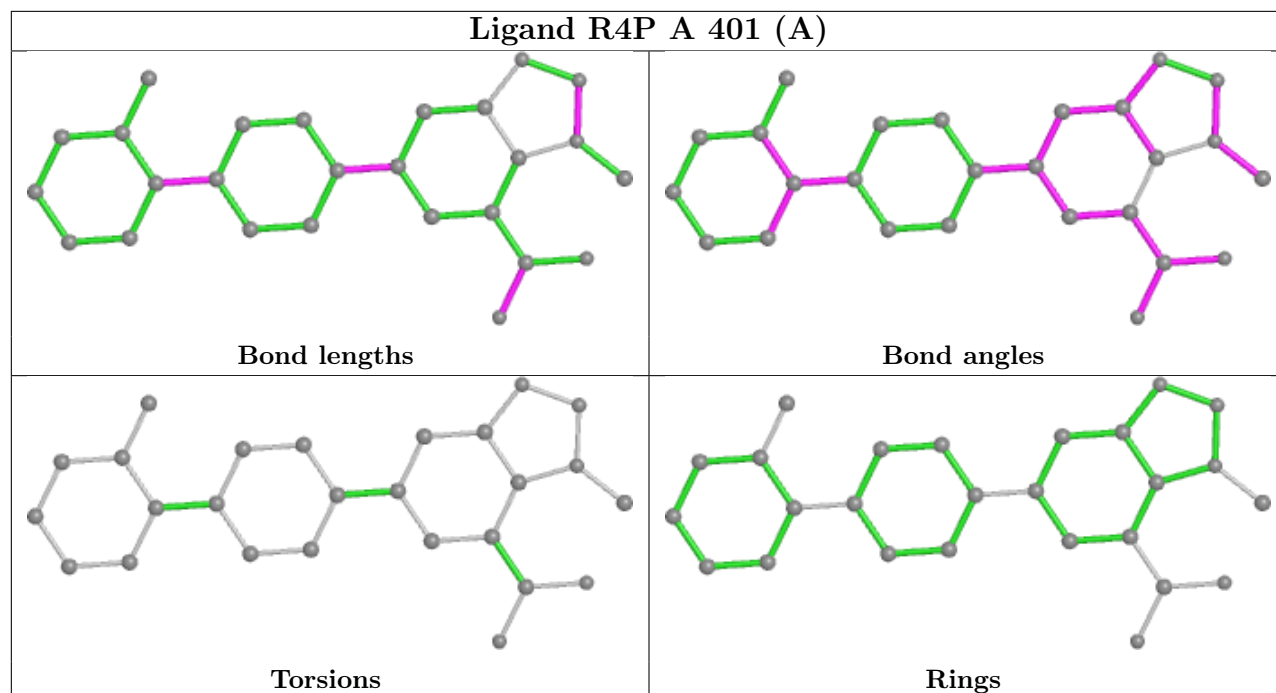
There are no ring outliers.

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.