



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 2, 2023 – 04:00 AM EDT

PDB ID : 6MCU  
Title : Crystal structure of the holo retinal-bound domain-swapped dimer Q108K:T51D:A28H mutant of human Cellular Retinol Binding Protein II  
Authors : Ghanbarpour, A.; Geiger, J.  
Deposited on : 2018-09-02  
Resolution : 2.57 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 2.57 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 4 unique types of molecules in this entry. The entry contains 13473 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 Retinol-binding protein 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	133	1101	691	190	215	5	0	0	0
1	B	133	1101	691	190	215	5	0	0	0
1	C	133	1101	691	190	215	5	0	0	0
1	D	133	1101	691	190	215	5	0	0	0
1	E	133	1101	691	189	216	5	0	1	0
1	F	133	1101	691	190	215	5	0	0	0
1	G	133	1101	691	190	215	5	0	0	0
1	H	133	1101	691	190	215	5	0	0	0
1	I	133	1095	688	187	215	5	0	0	0
1	J	133	1101	691	190	215	5	0	0	0
1	K	133	1101	691	190	215	5	0	0	0
1	L	133	1101	691	190	215	5	0	0	0

There are 36 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	28	HIS	ALA	engineered mutation	UNP P50120
A	51	ASP	THR	engineered mutation	UNP P50120
A	108	LYS	GLN	engineered mutation	UNP P50120
B	28	HIS	ALA	engineered mutation	UNP P50120
B	51	ASP	THR	engineered mutation	UNP P50120

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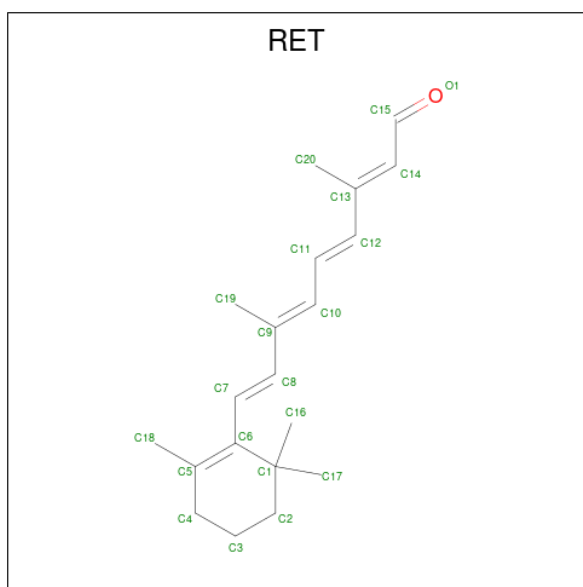
Chain	Residue	Modelled	Actual	Comment	Reference
B	108	LYS	GLN	engineered mutation	UNP P50120
C	28	HIS	ALA	engineered mutation	UNP P50120
C	51	ASP	THR	engineered mutation	UNP P50120
C	108	LYS	GLN	engineered mutation	UNP P50120
D	28	HIS	ALA	engineered mutation	UNP P50120
D	51	ASP	THR	engineered mutation	UNP P50120
D	108	LYS	GLN	engineered mutation	UNP P50120
E	28	HIS	ALA	engineered mutation	UNP P50120
E	51	ASP	THR	engineered mutation	UNP P50120
E	108	LYS	GLN	engineered mutation	UNP P50120
F	28	HIS	ALA	engineered mutation	UNP P50120
F	51	ASP	THR	engineered mutation	UNP P50120
F	108	LYS	GLN	engineered mutation	UNP P50120
G	28	HIS	ALA	engineered mutation	UNP P50120
G	51	ASP	THR	engineered mutation	UNP P50120
G	108	LYS	GLN	engineered mutation	UNP P50120
H	28	HIS	ALA	engineered mutation	UNP P50120
H	51	ASP	THR	engineered mutation	UNP P50120
H	108	LYS	GLN	engineered mutation	UNP P50120
I	28	HIS	ALA	engineered mutation	UNP P50120
I	51	ASP	THR	engineered mutation	UNP P50120
I	108	LYS	GLN	engineered mutation	UNP P50120
J	28	HIS	ALA	engineered mutation	UNP P50120
J	51	ASP	THR	engineered mutation	UNP P50120
J	108	LYS	GLN	engineered mutation	UNP P50120
K	28	HIS	ALA	engineered mutation	UNP P50120
K	51	ASP	THR	engineered mutation	UNP P50120
K	108	LYS	GLN	engineered mutation	UNP P50120
L	28	HIS	ALA	engineered mutation	UNP P50120
L	51	ASP	THR	engineered mutation	UNP P50120
L	108	LYS	GLN	engineered mutation	UNP P50120

- Molecule 2 is GLYCEROL (three-letter code: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	F	1	Total C O 6 3 3	0	0
2	H	1	Total C O 6 3 3	0	0
2	L	1	Total C O 6 3 3	0	0

- Molecule 3 is RETINAL (three-letter code: RET) (formula: C<sub>20</sub>H<sub>28</sub>O).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	F	1	Total C 20 20	0	0

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	G	1	Total C 20 20	0	0
3	H	1	Total C 20 20	0	0
3	J	1	Total C 20 20	0	0
3	K	1	Total C 20 20	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	14	Total O 14 14	0	0
4	B	9	Total O 9 9	0	0
4	C	17	Total O 17 17	0	0
4	D	12	Total O 12 12	0	0
4	E	11	Total O 11 11	0	0
4	F	14	Total O 14 14	0	0
4	G	14	Total O 14 14	0	0
4	H	16	Total O 16 16	0	0
4	I	8	Total O 8 8	0	0
4	J	11	Total O 11 11	0	0
4	K	13	Total O 13 13	0	0
4	L	10	Total O 10 10	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 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	65.87Å 73.99Å 349.99Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.20 – 2.57	Depositor
% Data completeness (in resolution range)	91.3 (49.20-2.57)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.48 (at 2.58Å)	Xtrriage
Refinement program	PHENIX (1.11.1_2575)	Depositor
R, $R_{free}$	0.231 , 0.296	Depositor
Wilson B-factor (Å <sup>2</sup> )	35.6	Xtrriage
Anisotropy	0.309	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	13473	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	39.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 21.00 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 7.6920e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<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](#)

8 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	GOL	F	201	-	5,5,5	0.38	0	5,5,5	0.25	0
3	RET	F	202	1	20,20,21	0.69	1 (5%)	27,27,28	0.40	0
2	GOL	H	201	-	5,5,5	0.36	0	5,5,5	0.25	0
3	RET	J	201	1	20,20,21	0.70	1 (5%)	27,27,28	0.39	0
3	RET	K	201	1	20,20,21	0.70	1 (5%)	27,27,28	0.28	0
3	RET	H	202	1	20,20,21	0.72	1 (5%)	27,27,28	0.31	0
3	RET	G	201	1	20,20,21	1.05	1 (5%)	27,27,28	1.02	1 (3%)
2	GOL	L	201	-	5,5,5	0.36	0	5,5,5	0.22	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
2	GOL	F	201	-	-	0/4/4/4	-
3	RET	F	202	1	-	5/13/30/31	0/1/1/1
2	GOL	H	201	-	-	2/4/4/4	-
3	RET	J	201	1	-	7/13/30/31	0/1/1/1
3	RET	K	201	1	-	4/13/30/31	0/1/1/1
3	RET	H	202	1	-	4/13/30/31	0/1/1/1
3	RET	G	201	1	-	3/13/30/31	0/1/1/1
2	GOL	L	201	-	-	2/4/4/4	-

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	G	201	RET	C8-C7	3.36	1.43	1.33
3	H	202	RET	C14-C13	2.84	1.36	1.33
3	K	201	RET	C14-C13	2.77	1.35	1.33
3	J	201	RET	C14-C13	2.71	1.35	1.33
3	F	202	RET	C14-C13	2.71	1.35	1.33

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	G	201	RET	C8-C7-C6	4.01	138.47	127.20

There are no chirality outliers.

All (27) torsion outliers are listed below:

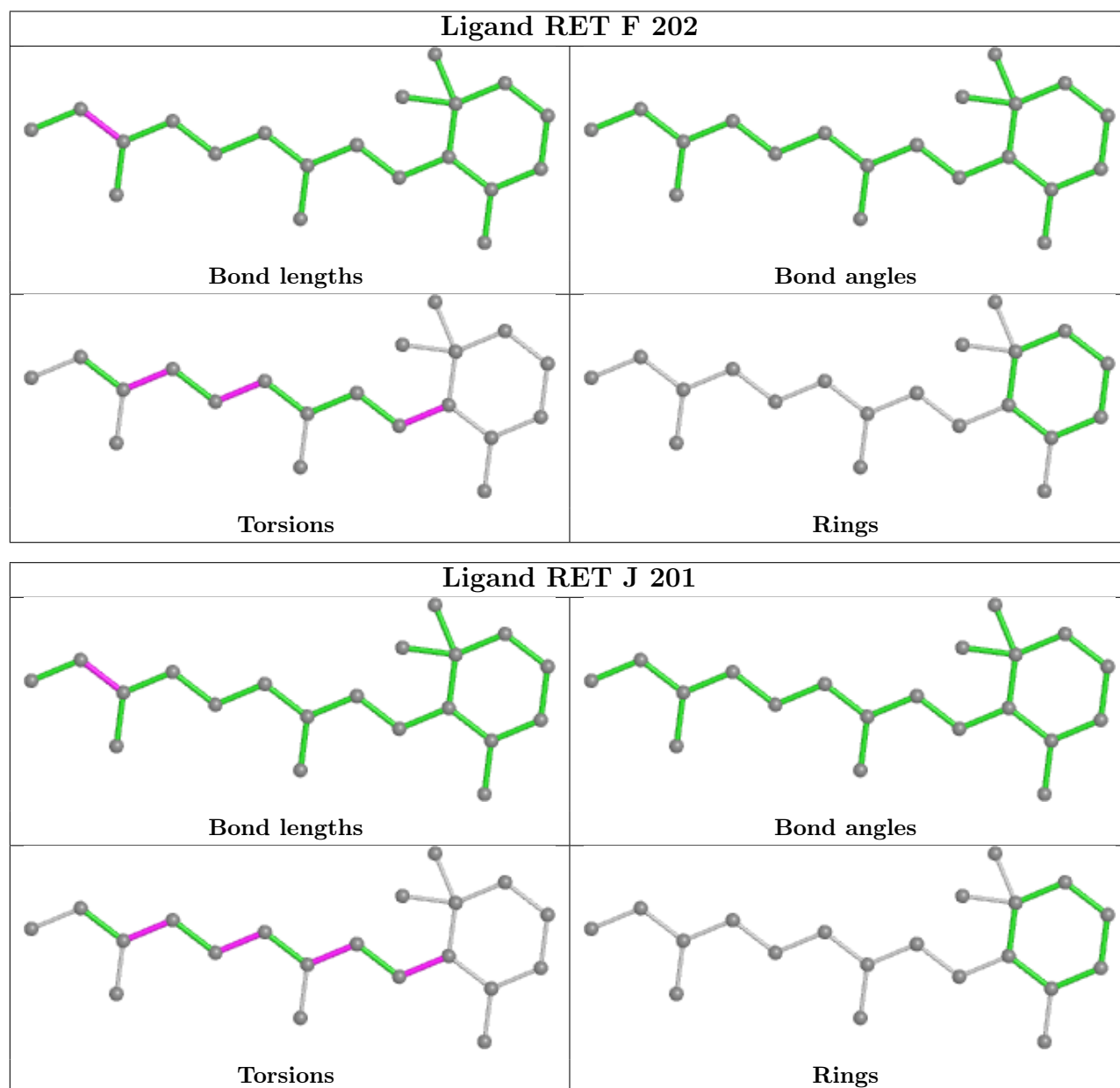
Mol	Chain	Res	Type	Atoms
2	H	201	GOL	O1-C1-C2-C3
3	F	202	RET	C5-C6-C7-C8
3	G	201	RET	C11-C12-C13-C14
3	G	201	RET	C11-C12-C13-C20
3	H	202	RET	C5-C6-C7-C8
3	H	202	RET	C7-C8-C9-C10
3	H	202	RET	C7-C8-C9-C19
3	J	201	RET	C1-C6-C7-C8
3	J	201	RET	C9-C10-C11-C12
3	J	201	RET	C11-C12-C13-C20
3	F	202	RET	C9-C10-C11-C12
3	F	202	RET	C11-C12-C13-C20
3	J	201	RET	C7-C8-C9-C10
3	J	201	RET	C11-C12-C13-C14
3	K	201	RET	C7-C8-C9-C10
3	J	201	RET	C7-C8-C9-C19
3	K	201	RET	C7-C8-C9-C19
2	L	201	GOL	O1-C1-C2-C3
2	H	201	GOL	O1-C1-C2-O2
2	L	201	GOL	O1-C1-C2-O2
3	F	202	RET	C1-C6-C7-C8
3	H	202	RET	C1-C6-C7-C8
3	J	201	RET	C5-C6-C7-C8
3	K	201	RET	C1-C6-C7-C8
3	K	201	RET	C5-C6-C7-C8
3	G	201	RET	C9-C10-C11-C12
3	F	202	RET	C11-C12-C13-C14

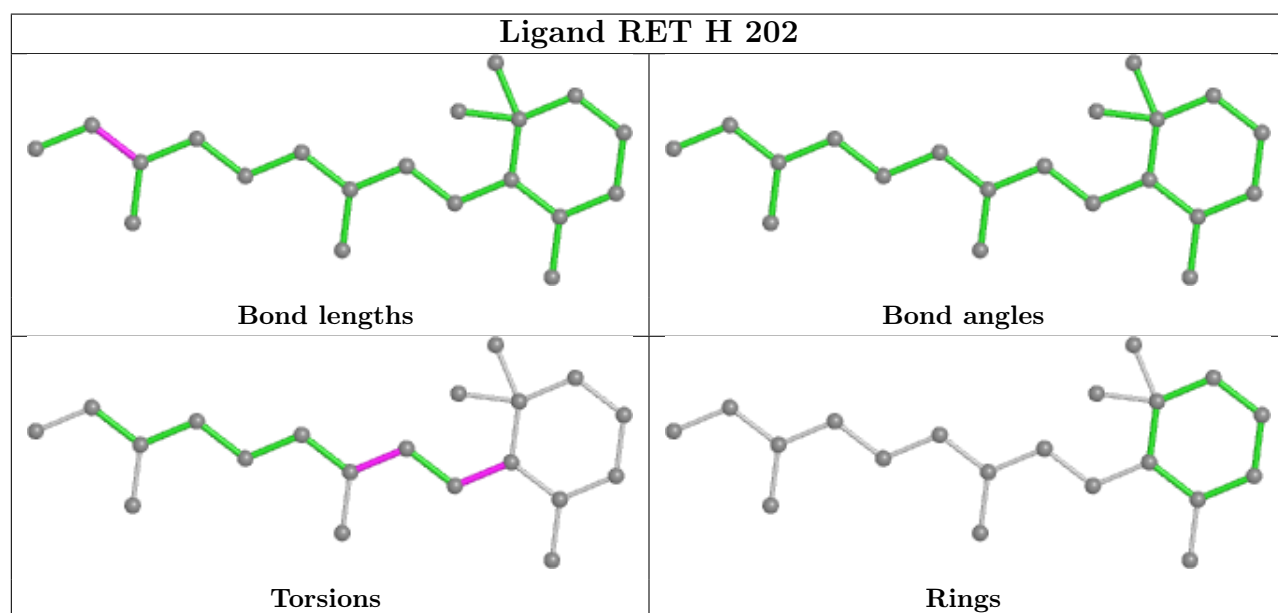
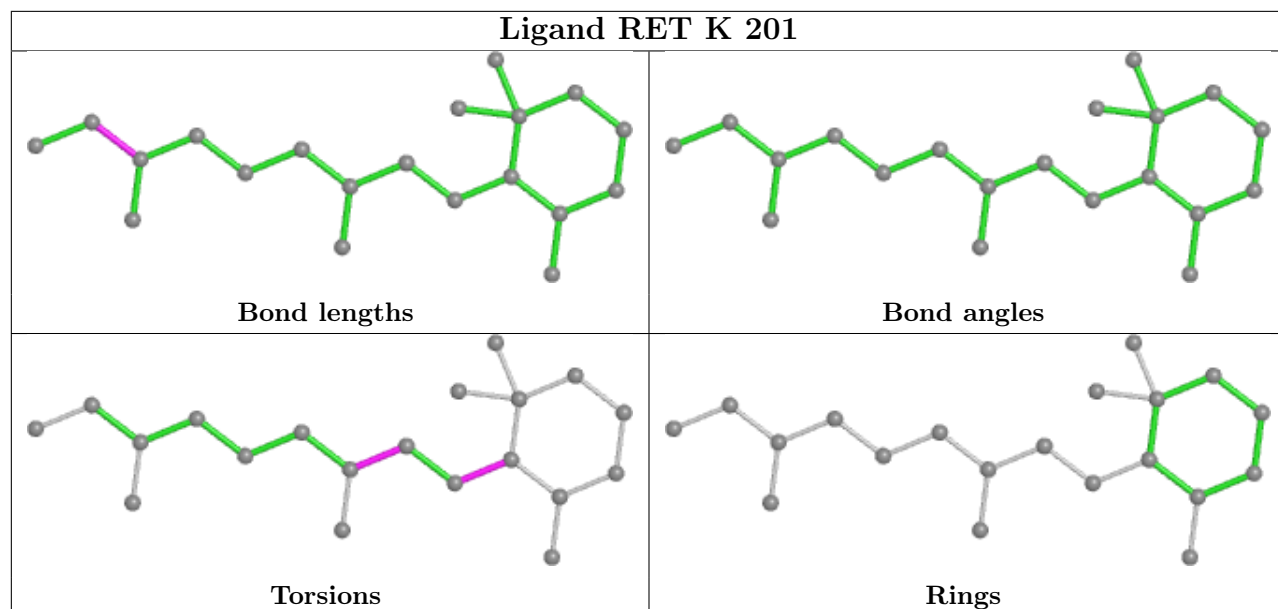
There are no ring outliers.

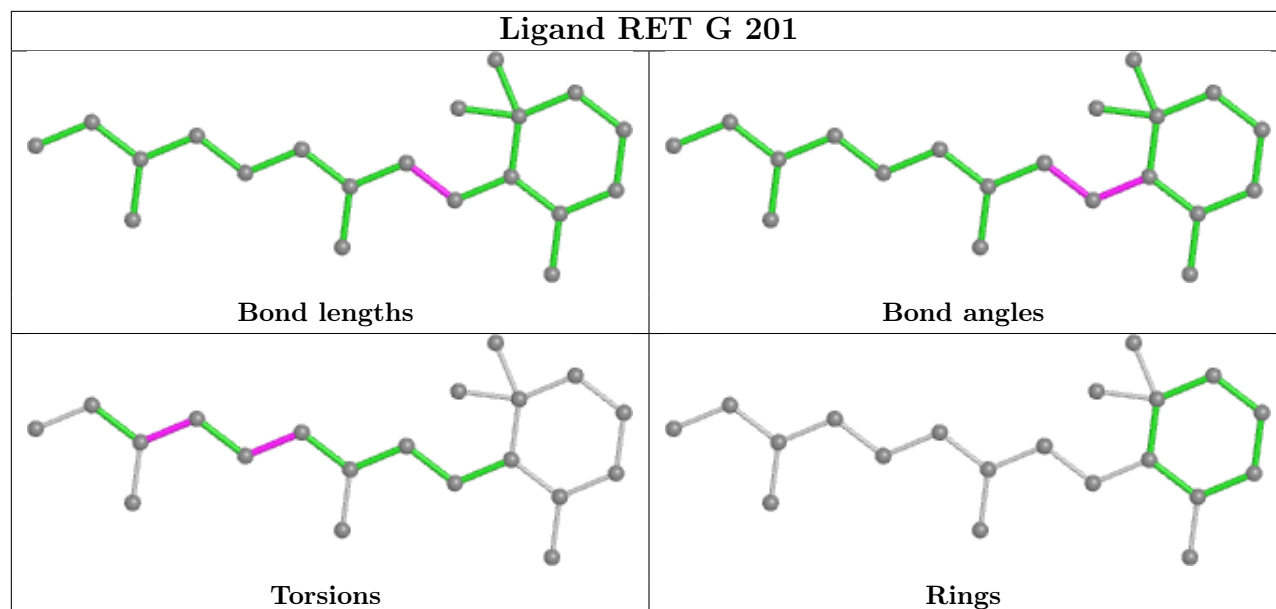
No monomer is involved in short contacts.

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.