



# wwPDB X-ray Structure Validation Summary Report ⓘ

May 28, 2020 – 09:03 pm BST

PDB ID : 1XIU  
Title : Crystal structure of the agonist-bound ligand-binding domain of Biomphalaria glabrata RXR  
Authors : De Groot, A.; De Rosny, E.; Juillan-Binard, C.; Ferrer, J.-L.; Laudet, V.; Pebay-Peroula, E.; Fontecilla-Camps, J.-C.; Borel, F.  
Deposited on : 2004-09-22  
Resolution : 2.50 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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.

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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) : 1.13  
EDS : 2.11  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.11

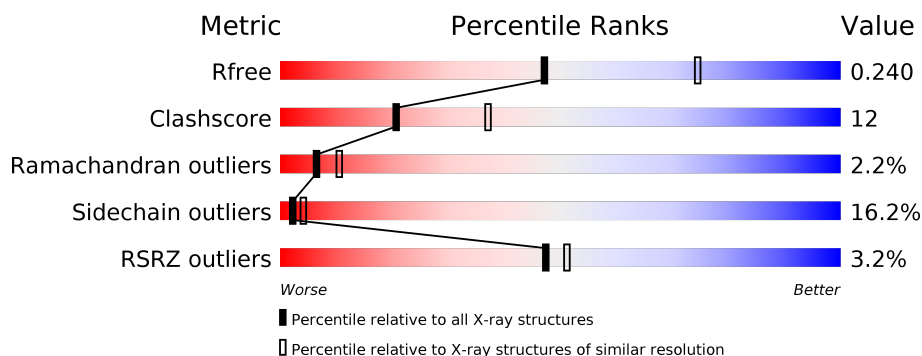
# 1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.50 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))
$R_{free}$	130704	4661 (2.50-2.50)
Clashscore	141614	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)
RSRZ outliers	127900	4559 (2.50-2.50)

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  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	230	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, grey);"></div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span>67%</span> <span>20%</span> <span>7%</span> <span>• •</span> </div> </div>
1	B	230	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, grey);"></div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span>64%</span> <span>26%</span> <span>6%</span> <span>• •</span> </div> </div>
2	E	15	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, grey);"></div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span>20%</span> <span>33%</span> <span>40%</span> <span>7%</span> <span>20%</span> </div> </div>
2	F	15	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red, orange, yellow, green, grey);"></div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span>13%</span> <span>27%</span> <span>27%</span> <span>13%</span> <span>33%</span> </div> </div>

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 3782 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.

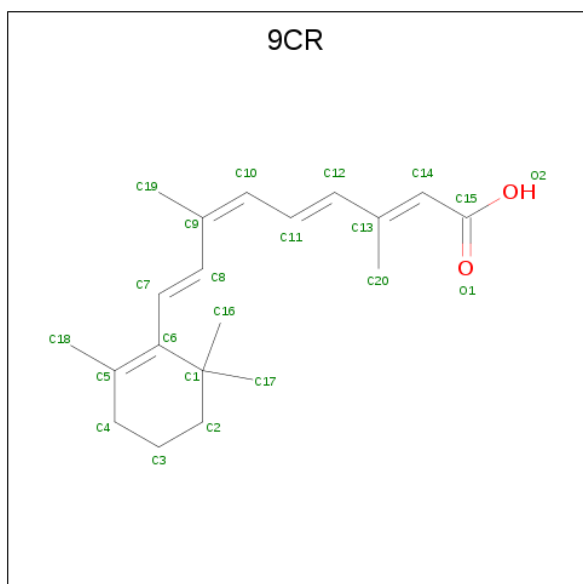
- Molecule 1 is a protein called RXR-like protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	221	Total	C	N	O	S	0	0	0
			1748	1124	297	317	10			
1	B	224	Total	C	N	O	S	0	0	0
			1759	1132	300	317	10			

- Molecule 2 is a protein called Nuclear receptor coactivator 1.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	E	12	Total	C	N	O	0	0	0
			100	63	21	16			
2	F	10	Total	C	N	O	0	0	0
			84	54	17	13			

- Molecule 3 is (9cis)-retinoic acid (three-letter code: 9CR) (formula: C<sub>20</sub>H<sub>28</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			22	20	2		
3	B	1	Total	C	O	0	0
			22	20	2		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	28	Total	O	0	0
			28	28		
4	B	17	Total	O	0	0
			17	17		
4	E	1	Total	O	0	0
			1	1		
4	F	1	Total	O	0	0
			1	1		



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 61 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	87.10 Å 87.10 Å 320.40 Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	24.40 – 2.50 24.42 – 2.50	Depositor EDS
% Data completeness (in resolution range)	100.0 (24.40-2.50) 99.7 (24.42-2.50)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.09	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.73 (at 2.50 Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, $R_{free}$	0.193 , 0.243 0.190 , 0.240	Depositor DCC
$R_{free}$ test set	1292 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	47.5	Xtriage
Anisotropy	0.488	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 40.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	3782	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	46.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.60% 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.

## 5 Model quality [i](#)

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

Bond lengths and bond angles in the following residue types are not validated in this section: 9CR

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	1.42	9/1781 (0.5%)	1.29	19/2409 (0.8%)
1	B	1.30	4/1793 (0.2%)	1.30	19/2428 (0.8%)
2	E	1.18	0/101	1.34	1/133 (0.8%)
2	F	1.30	0/84	1.74	2/110 (1.8%)
All	All	1.36	13/3759 (0.3%)	1.30	41/5080 (0.8%)

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

The worst 5 of 13 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	219	GLU	CG-CD	8.50	1.64	1.51
1	A	229	ASP	CB-CG	8.03	1.68	1.51
1	A	362	GLU	CG-CD	7.66	1.63	1.51
1	A	385	GLU	CD-OE1	6.08	1.32	1.25
1	A	219	GLU	CD-OE1	5.85	1.32	1.25

The worst 5 of 41 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	395	ARG	NE-CZ-NH1	13.39	126.99	120.30
1	B	395	ARG	NE-CZ-NH2	-10.33	115.13	120.30
1	B	345	ARG	NE-CZ-NH2	-9.95	115.33	120.30
1	A	332	ARG	NE-CZ-NH2	-9.79	115.41	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	395	ARG	NE-CZ-NH1	8.92	124.76	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	233	ASP	Peptide

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

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	1748	0	1786	42	1
1	B	1759	0	1792	40	1
2	E	100	0	105	4	0
2	F	84	0	93	5	0
3	A	22	0	27	2	0
3	B	22	0	27	7	0
4	A	28	0	0	11	0
4	B	17	0	0	3	0
4	E	1	0	0	0	0
4	F	1	0	0	2	0
All	All	3782	0	3830	93	1

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 12.

The worst 5 of 93 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:229:ASP:HA	4:A:40:HOH:O	1.32	1.25
1:A:210:ASN:HB3	4:A:46:HOH:O	1.48	1.13
2:F:688:LYS:HB2	4:F:31:HOH:O	1.47	1.11
1:A:234:ALA:HB1	4:A:33:HOH:O	1.52	1.06
1:A:381:ARG:HG2	4:A:43:HOH:O	1.68	0.94

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:230:THR:O	1:B:231:TYR:O[6_655]	2.07	0.13

## 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	219/230 (95%)	205 (94%)	11 (5%)	3 (1%)	11	20
1	B	222/230 (96%)	206 (93%)	11 (5%)	5 (2%)	6	10
2	E	10/15 (67%)	9 (90%)	0	1 (10%)	0	0
2	F	8/15 (53%)	5 (62%)	2 (25%)	1 (12%)	0	0
All	All	459/490 (94%)	425 (93%)	24 (5%)	10 (2%)	6	10

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	229	ASP
1	B	236	LYS
1	B	420	PRO
2	F	689	ILE
1	A	231	TYR

### 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	188/197 (95%)	161 (86%)	27 (14%)	3	6
1	B	188/197 (95%)	156 (83%)	32 (17%)	2	3
2	E	11/14 (79%)	7 (64%)	4 (36%)	0	0
2	F	9/14 (64%)	8 (89%)	1 (11%)	6	11
All	All	396/422 (94%)	332 (84%)	64 (16%)	2	4

5 of 64 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	218	LEU
1	B	259	ARG
2	E	688	LYS
1	B	222	LEU
1	B	236	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 7 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	312	HIS
2	E	695	GLN
1	B	313	GLN
1	B	209	ASN
1	B	365	GLN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

## 5.6 Ligand geometry

2 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$
3	9CR	A	201	-	19,22,22	2.50	5 (26%)	26,30,30	2.72	11 (42%)
3	9CR	B	202	-	19,22,22	2.55	6 (31%)	26,30,30	3.08	11 (42%)

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
3	9CR	A	201	-	-	8/13/32/32	0/1/1/1
3	9CR	B	202	-	-	5/13/32/32	0/1/1/1

The worst 5 of 11 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	202	9CR	C10-C9	6.48	1.44	1.35
3	A	201	9CR	C5-C6	5.40	1.43	1.34
3	A	201	9CR	C10-C9	4.87	1.42	1.35
3	B	202	9CR	C11-C12	4.86	1.47	1.34
3	A	201	9CR	C11-C12	4.82	1.47	1.34

The worst 5 of 22 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	202	9CR	C11-C10-C9	-8.15	115.68	127.31
3	A	201	9CR	C11-C10-C9	-7.53	116.56	127.31
3	B	202	9CR	C18-C5-C6	-5.99	117.80	124.53
3	B	202	9CR	C7-C8-C9	-5.98	117.19	126.23
3	A	201	9CR	C7-C8-C9	-5.88	117.35	126.23

There are no chirality outliers.

5 of 13 torsion outliers are listed below:

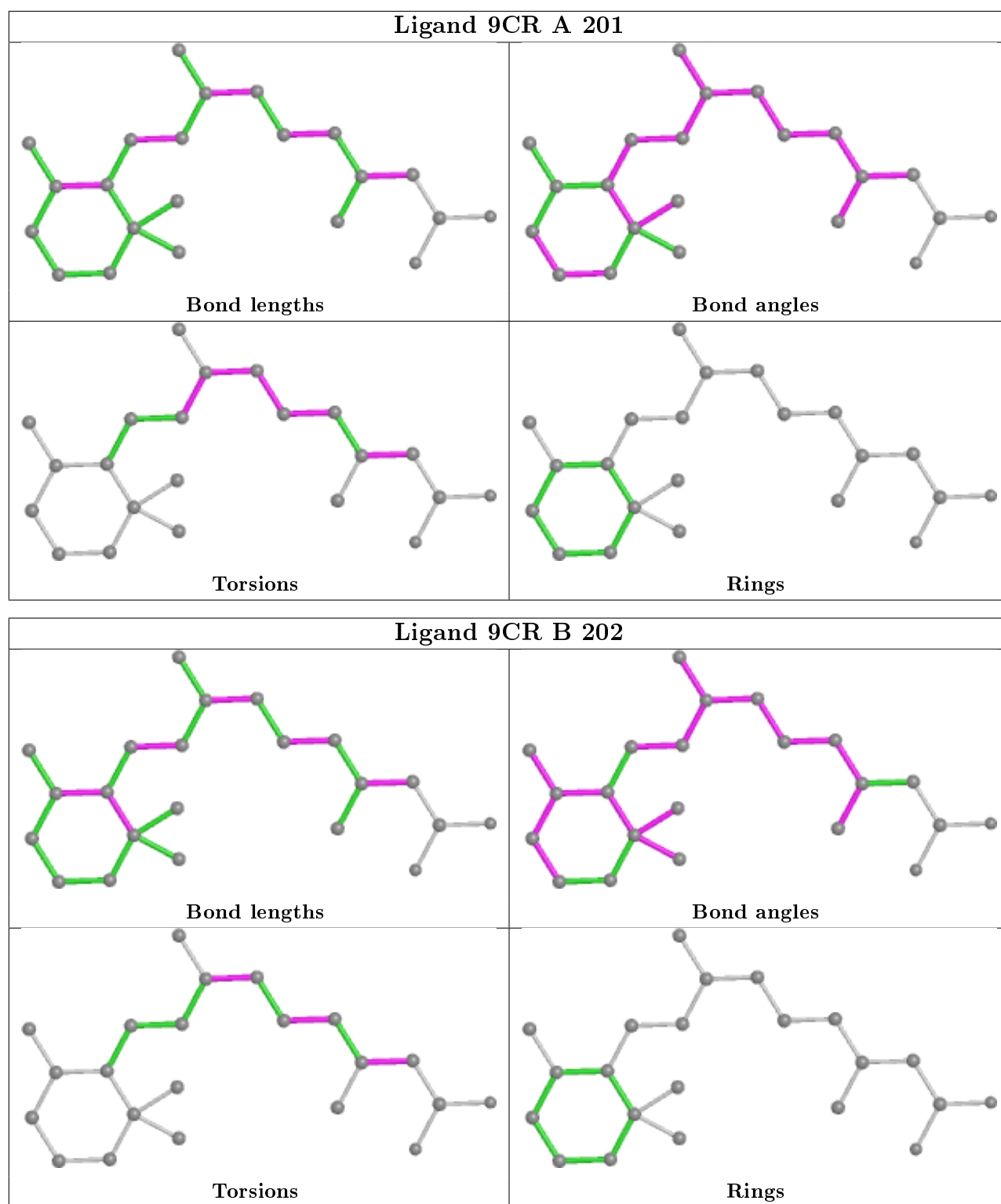
Mol	Chain	Res	Type	Atoms
3	A	201	9CR	C7-C8-C9-C10
3	A	201	9CR	C7-C8-C9-C19
3	A	201	9CR	C12-C13-C14-C15
3	A	201	9CR	C20-C13-C14-C15
3	B	202	9CR	C12-C13-C14-C15

There are no ring outliers.

2 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	201	9CR	2	0
3	B	202	9CR	7	0

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 ⓘ

There are no such residues in this entry.

## 5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

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

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

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	221/230 (96%)	-0.19	3 (1%) 75 77	30, 42, 59, 77	0
1	B	224/230 (97%)	-0.21	7 (3%) 49 52	32, 45, 63, 85	0
2	E	12/15 (80%)	1.42	3 (25%) 0 0	54, 67, 95, 99	0
2	F	10/15 (66%)	0.77	2 (20%) 1 0	66, 70, 91, 94	0
All	All	467/490 (95%)	-0.14	15 (3%) 47 51	30, 44, 68, 99	0

The worst 5 of 15 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	E	698	SER	9.4
2	E	697	GLY	5.0
2	F	697	GLY	4.5
2	F	696	GLU	3.6
1	A	227	LYS	3.5

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

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

### 6.3 Carbohydrates [i](#)

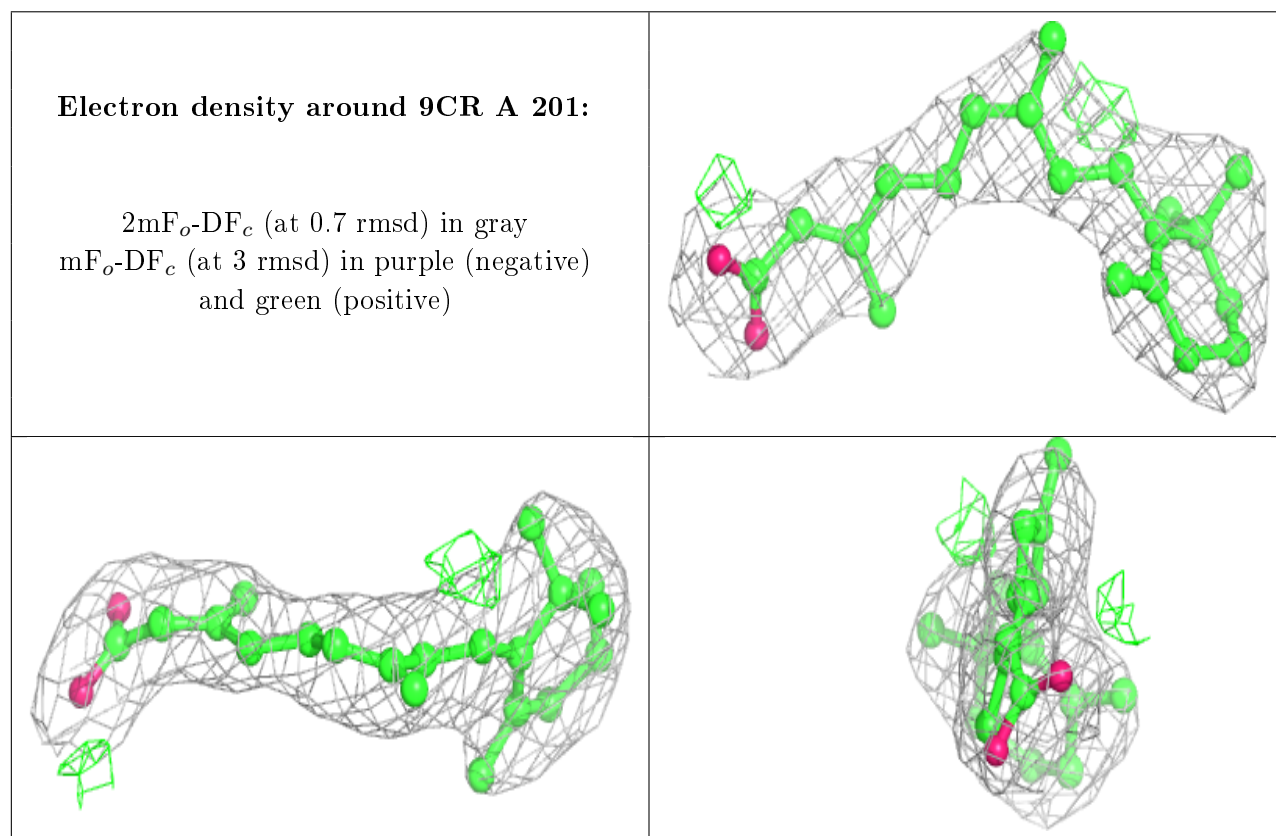
There are no carbohydrates in this entry.

### 6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 0.9’ lists the number of atoms with occupancy less than 0.9.

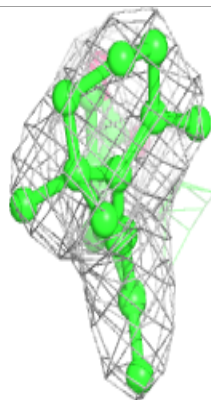
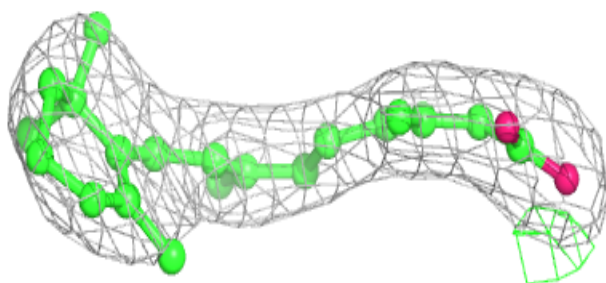
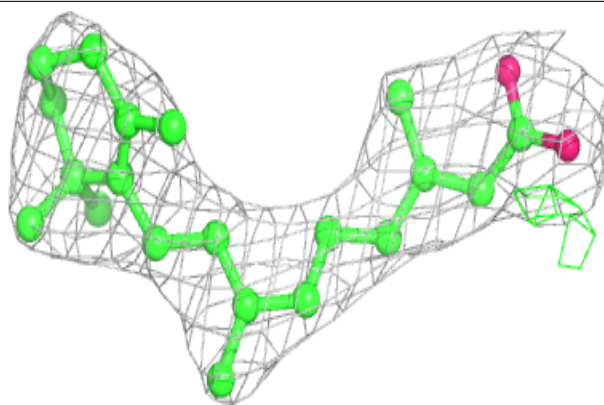
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	9CR	A	201	22/22	0.97	0.14	39,43,48,51	0
3	9CR	B	202	22/22	0.97	0.16	38,42,49,52	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.



**Electron density around 9CR B 202:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



## 6.5 Other polymers [i](#)

There are no such residues in this entry.