



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 8, 2025 – 01:08 pm BST

PDB ID : 9QXN / pdb\_00009qxn  
Title : Crystal Structure of wild-type EGFR in complex with the reversible inhibitor Sevabertinib (BAY 2927088)  
Authors : Hillig, R.C.  
Deposited on : 2025-04-16  
Resolution : 2.14 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 : 4-5-2 with Phenix2.0  
Mogul : 1.8.4, CSD as541be (2020)  
Xtriage (Phenix) : 2.0  
EDS : 3.0  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
CCP4 : 9.0.010 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.46

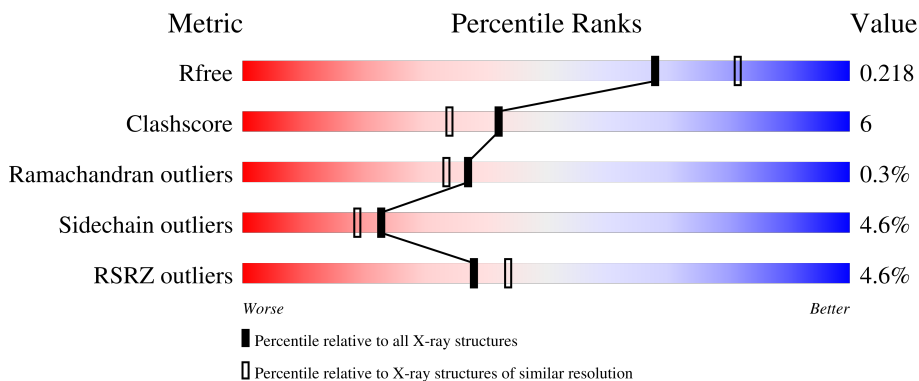
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.14 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))
$R_{free}$	164625	3336 (2.16-2.12)
Clashscore	180529	3585 (2.16-2.12)
Ramachandran outliers	177936	3554 (2.16-2.12)
Sidechain outliers	177891	3553 (2.16-2.12)
RSRZ outliers	164620	3337 (2.16-2.12)

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 of 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	AAA	346	

## 2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 3162 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.

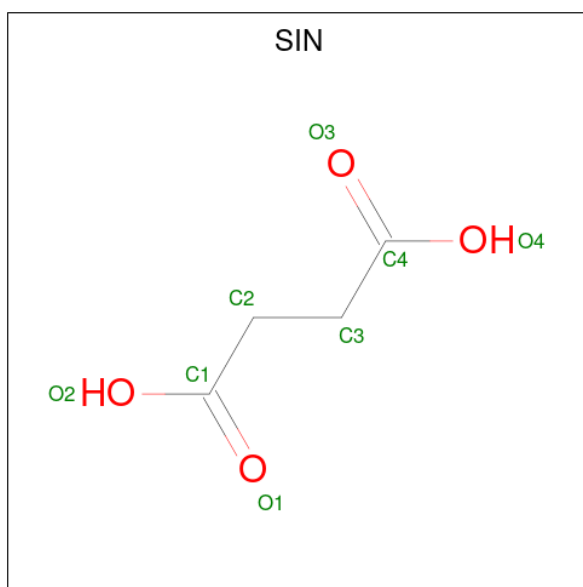
- Molecule 1 is a protein called Epidermal growth factor receptor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	AAA	324	2649	1705	442	481	21	0	10	0

There are 19 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
AAA	677	MET	-	initiating methionine	UNP P00533
AAA	678	SER	-	expression tag	UNP P00533
AAA	679	HIS	-	expression tag	UNP P00533
AAA	680	HIS	-	expression tag	UNP P00533
AAA	681	HIS	-	expression tag	UNP P00533
AAA	682	HIS	-	expression tag	UNP P00533
AAA	683	HIS	-	expression tag	UNP P00533
AAA	684	ALA	-	expression tag	UNP P00533
AAA	685	MET	-	expression tag	UNP P00533
AAA	686	THR	-	expression tag	UNP P00533
AAA	687	GLU	-	expression tag	UNP P00533
AAA	688	ASN	-	expression tag	UNP P00533
AAA	689	LEU	-	expression tag	UNP P00533
AAA	690	TYR	-	expression tag	UNP P00533
AAA	691	PHE	-	expression tag	UNP P00533
AAA	692	GLN	-	expression tag	UNP P00533
AAA	693	GLY	-	expression tag	UNP P00533
AAA	694	ALA	-	expression tag	UNP P00533
AAA	695	MET	-	expression tag	UNP P00533

- Molecule 2 is SUCCINIC ACID (CCD ID: SIN) (formula: C<sub>4</sub>H<sub>6</sub>O<sub>4</sub>).

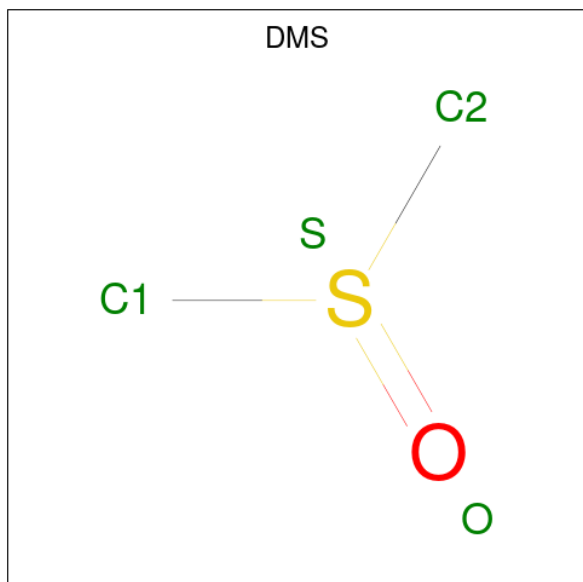


Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	AAA	1	Total C O 8 4 4	0	0
2	AAA	1	Total C O 8 4 4	0	0

- Molecule 3 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	AAA	1	Total Cl 1 1	0	0

- Molecule 4 is DIMETHYL SULFOXIDE (CCD ID: DMS) (formula: C<sub>2</sub>H<sub>6</sub>OS).



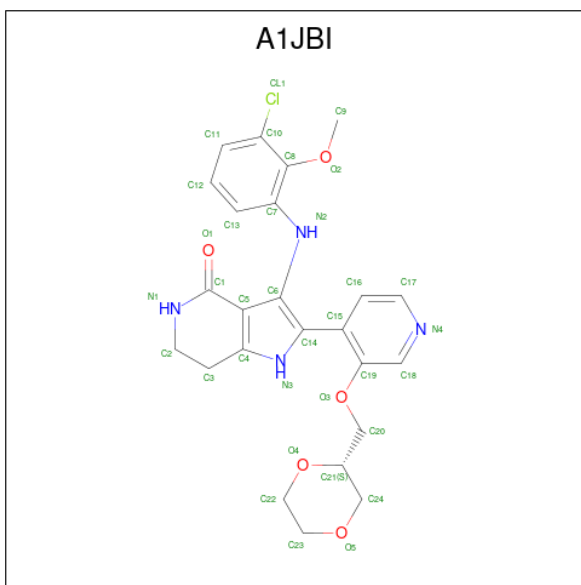
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	AAA	1	Total	C	O	S	0	0
			4	2	1	1		
4	AAA	1	Total	C	O	S	0	0
			4	2	1	1		

- Molecule 5 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	AAA	1	Total	C	O	0	0
			4	2	2		

- Molecule 6 is 3-[(3-chloranyl-2-methoxy-phenyl)amino]-2-[3-[[2-(S)-1,4-dioxan-2-yl]methoxy]pyridin-4-yl]-1,5,6,7-tetrahydropyrrolo[3,2-c]pyridin-4-one (CCD ID: A1JBI) (formula: C<sub>24</sub>H<sub>25</sub>ClN<sub>4</sub>O<sub>5</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	Cl	N	O		
6	AAA	1	34	24	1	4	5	0	0

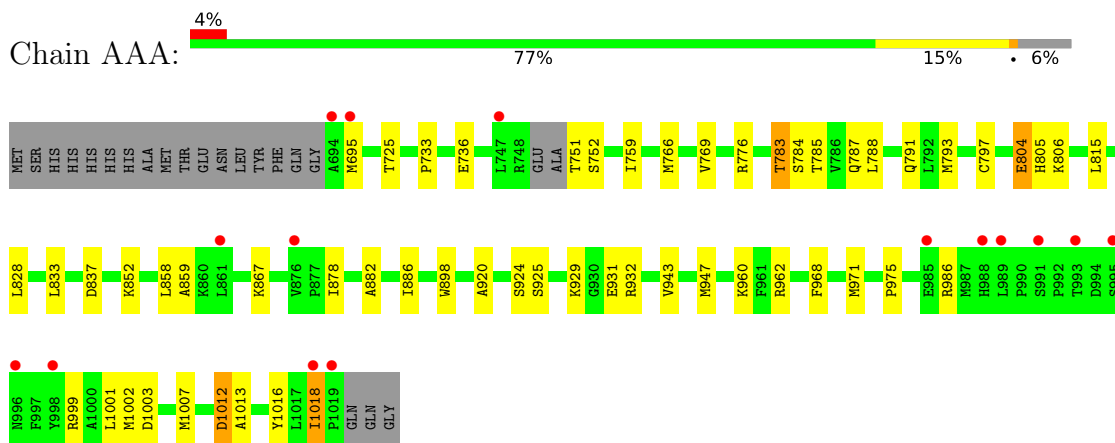
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	AAA	450	Total	O	0	0
			450	450		

### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ( $RSRZ > 2$ ). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

- Molecule 1: Epidermal growth factor receptor



## 4 Data and refinement statistics i

Property	Value	Source
Space group	I 2 3	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	147.43Å 147.43Å 147.43Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	28.93 – 2.14 28.93 – 2.14	Depositor EDS
% Data completeness (in resolution range)	99.9 (28.93-2.14) 99.9 (28.93-2.14)	Depositor EDS
$R_{merge}$	0.13	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.79 (at 2.14Å)	Xtrriage
Refinement program	REFMAC 5.8.0258	Depositor
R, $R_{free}$	0.156 , 0.210 0.165 , 0.218	Depositor DCC
$R_{free}$ test set	1224 reflections (4.17%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	42.6	Xtrriage
Anisotropy	0.000	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 52.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.027 for -l,-k,-h	Xtrriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	3162	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	61.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.79% 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: EDO, DMS, A1JBI, CL, SIN

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	AAA	0.99	0/2736	1.32	0/3699

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 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	AAA	2649	0	2714	32	0
2	AAA	16	0	8	2	0
3	AAA	1	0	0	1	0
4	AAA	8	0	12	0	0
5	AAA	4	0	6	0	0
6	AAA	34	0	0	0	0
7	AAA	450	0	0	10	1
All	All	3162	0	2740	34	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 6.

All (34) 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:AAA:797:CYS:SG	7:AAA:1214:HOH:O	2.03	1.12
1:AAA:791:GLN:NE2	7:AAA:1206:HOH:O	2.02	0.92
2:AAA:1101:SIN:O3	7:AAA:1204:HOH:O	1.97	0.81
3:AAA:1103:CL:CL	7:AAA:1647:HOH:O	2.44	0.72
1:AAA:833[B]:LEU:HD11	1:AAA:859:ALA:HB1	1.71	0.71
1:AAA:736:GLU:OE1	1:AAA:1016:TYR:OH	2.06	0.67
1:AAA:751:THR:HG22	1:AAA:751:THR:O	1.99	0.63
1:AAA:759[A]:ILE:HG12	1:AAA:788:LEU:HD13	1.82	0.61
1:AAA:1012:ASP:HB3	7:AAA:1206:HOH:O	2.02	0.59
1:AAA:962[B]:ARG:NH1	7:AAA:1216:HOH:O	2.36	0.57
1:AAA:878:ILE:HG21	1:AAA:920:ALA:HB1	1.88	0.54
1:AAA:1002[B]:MET:HE1	1:AAA:1007:MET:HA	1.90	0.52
1:AAA:695:MET:O	7:AAA:1207:HOH:O	2.20	0.47
1:AAA:815:LEU:HD12	1:AAA:975:PRO:HB3	1.97	0.46
1:AAA:882:ALA:HA	1:AAA:898:TRP:CD2	2.50	0.46
1:AAA:766:MET:O	1:AAA:769:VAL:HG22	2.16	0.46
1:AAA:733:PRO:HB2	1:AAA:736:GLU:HG3	1.96	0.46
1:AAA:886:ILE:HG21	1:AAA:924:SER:HB3	1.98	0.46
1:AAA:931:GLU:O	1:AAA:932:ARG:HD3	2.16	0.46
1:AAA:783:THR:OG1	1:AAA:785:THR:O	2.29	0.45
1:AAA:968:PHE:CD1	1:AAA:971:MET:CE	2.99	0.45
1:AAA:1002[B]:MET:CE	1:AAA:1007:MET:HA	2.46	0.45
1:AAA:776[A]:ARG:NH2	7:AAA:1228:HOH:O	2.49	0.45
1:AAA:986:ARG:NH1	7:AAA:1225:HOH:O	2.48	0.45
1:AAA:943:VAL:HG12	1:AAA:947:MET:HE3	1.99	0.44
1:AAA:791:GLN:HG3	1:AAA:1013:ALA:HB3	2.01	0.42
1:AAA:837:ASP:HB2	1:AAA:858:LEU:HD12	2.01	0.42
1:AAA:776[B]:ARG:NE	7:AAA:1221:HOH:O	2.52	0.42
1:AAA:793[B]:MET:HE1	1:AAA:852:LYS:HG3	2.01	0.42
1:AAA:787:GLN:HE22	2:AAA:1102:SIN:C3	2.33	0.42
1:AAA:751:THR:O	1:AAA:751:THR:CG2	2.68	0.42
1:AAA:925:SER:O	1:AAA:929[B]:LYS:HG2	2.19	0.42
1:AAA:804[A]:GLU:HG2	1:AAA:805:HIS:CE1	2.57	0.40
1:AAA:828:LEU:HD22	1:AAA:833[B]:LEU:HD23	2.03	0.40

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)
7:AAA:1410:HOH:O	7:AAA:1434:HOH:O[22_545]	2.09	0.11

## 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	AAA	330/346 (95%)	322 (98%)	7 (2%)	1 (0%)	37 33

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	AAA	1018	ILE

### 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	AAA	295/303 (97%)	281 (95%)	14 (5%)	22 18

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	AAA	725	THR
1	AAA	752	SER
1	AAA	783	THR
1	AAA	784	SER
1	AAA	804[A]	GLU
1	AAA	804[B]	GLU
1	AAA	806	LYS
1	AAA	867	LYS
1	AAA	960	LYS
1	AAA	999	ARG

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Mol	Chain	Res	Type
1	AAA	1001	LEU
1	AAA	1003	ASP
1	AAA	1012	ASP
1	AAA	1018	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 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 oligosaccharides in this entry.

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

Of 7 ligands modelled in this entry, 1 is monoatomic - leaving 6 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	$\# Z  > 2$
6	A1JBI	AAA	1107	-	34,38,38	0.82	1 (2%)	36,53,53	1.07	3 (8%)
4	DMS	AAA	1106	-	3,3,3	0.23	0	3,3,3	0.13	0
4	DMS	AAA	1104	-	3,3,3	0.23	0	3,3,3	0.09	0
5	EDO	AAA	1105	-	3,3,3	0.09	0	2,2,2	0.19	0
2	SIN	AAA	1101	-	7,7,7	1.06	0	8,8,8	1.12	0
2	SIN	AAA	1102	-	7,7,7	1.10	0	8,8,8	1.07	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
6	A1JBI	AAA	1107	-	-	1/11/33/33	0/5/5/5
5	EDO	AAA	1105	-	-	0/1/1/1	-
2	SIN	AAA	1101	-	-	5/5/5/5	-
2	SIN	AAA	1102	-	-	2/5/5/5	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	AAA	1107	A1JBI	C5-C1	-3.75	1.39	1.47

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
6	AAA	1107	A1JBI	C2-C3-C4	-2.66	108.08	113.00
6	AAA	1107	A1JBI	O4-C21-C24	2.43	111.93	109.46
6	AAA	1107	A1JBI	C6-N2-C7	2.23	127.67	123.01

There are no chirality outliers.

All (8) torsion outliers are listed below:

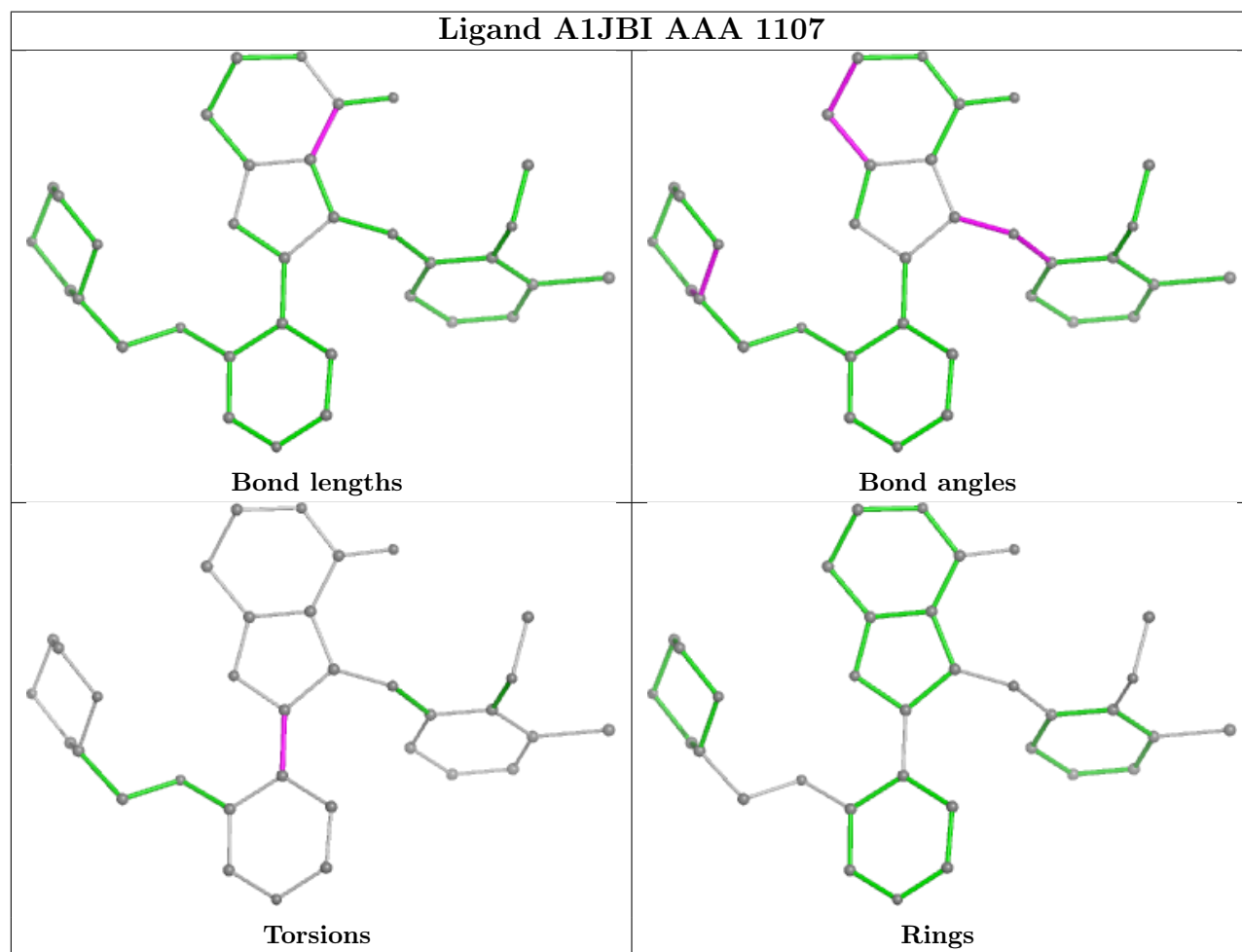
Mol	Chain	Res	Type	Atoms
6	AAA	1107	A1JBI	C6-C14-C15-C16
2	AAA	1101	SIN	C1-C2-C3-C4
2	AAA	1102	SIN	O2-C1-C2-C3
2	AAA	1102	SIN	O1-C1-C2-C3
2	AAA	1101	SIN	O1-C1-C2-C3
2	AAA	1101	SIN	O2-C1-C2-C3
2	AAA	1101	SIN	C2-C3-C4-O3
2	AAA	1101	SIN	C2-C3-C4-O4

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	AAA	1101	SIN	1	0
2	AAA	1102	SIN	1	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 [i](#)

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	AAA	324/346 (93%)	-0.01	15 (4%) 38 44	23, 51, 115, 143	10 (3%)

All (15) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	AAA	694	ALA	3.9
1	AAA	1018	ILE	3.8
1	AAA	695	MET	3.7
1	AAA	998	TYR	3.3
1	AAA	993	THR	3.3
1	AAA	995	SER	2.9
1	AAA	988	HIS	2.6
1	AAA	1019	PRO	2.4
1	AAA	747	LEU	2.3
1	AAA	996	ASN	2.3
1	AAA	861	LEU	2.2
1	AAA	985[A]	GLU	2.2
1	AAA	991	SER	2.2
1	AAA	989	LEU	2.2
1	AAA	876	VAL	2.0

### 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 oligosaccharides in this entry.

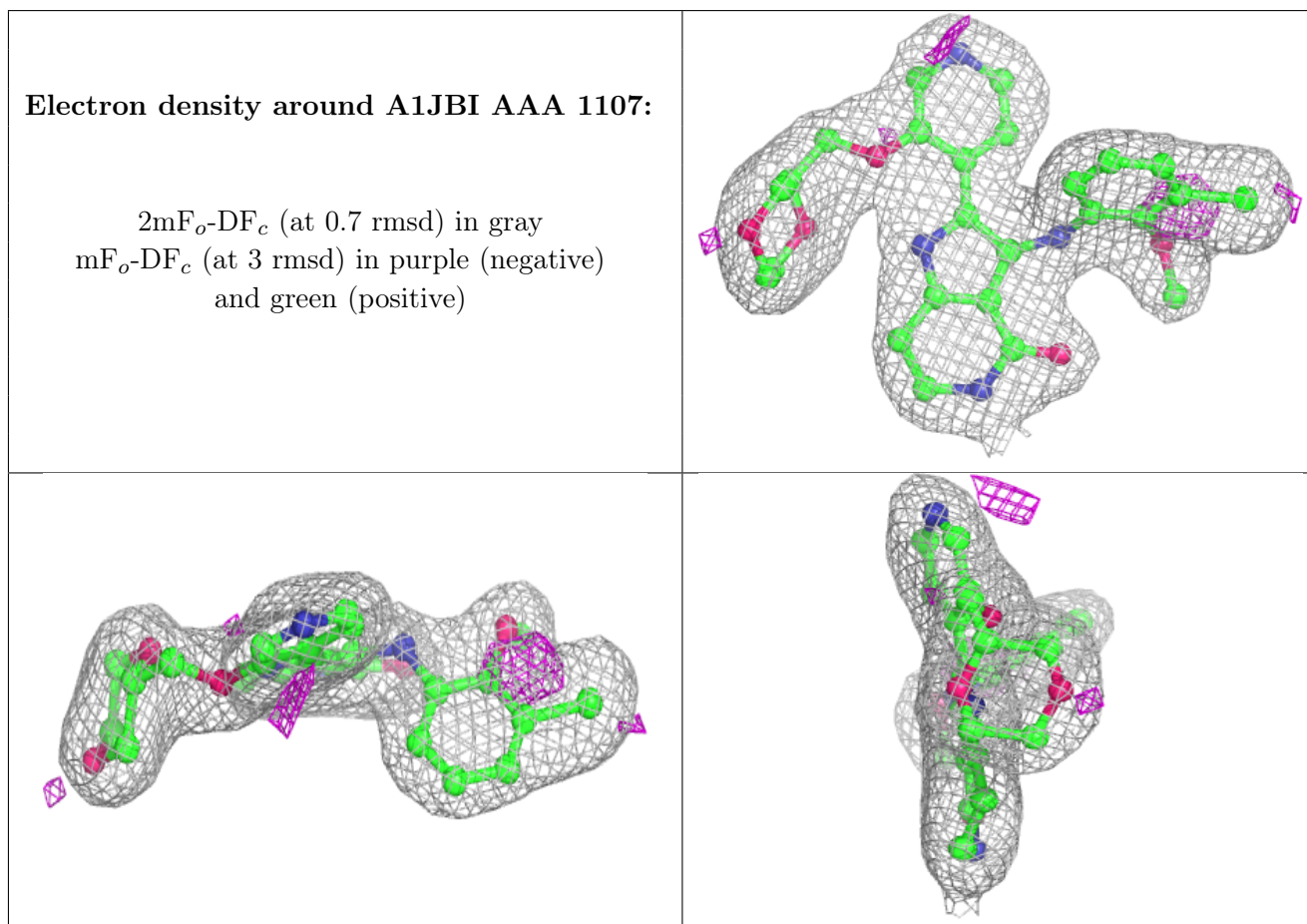


## 6.4 Ligands [i](#)

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(Å <sup>2</sup> )	Q<0.9
2	SIN	AAA	1101	8/8	0.81	0.16	60,79,82,83	0
4	DMS	AAA	1106	4/4	0.87	0.23	113,118,119,121	0
2	SIN	AAA	1102	8/8	0.89	0.12	88,97,99,99	0
5	EDO	AAA	1105	4/4	0.89	0.14	75,87,88,92	0
4	DMS	AAA	1104	4/4	0.92	0.19	107,112,113,118	0
3	CL	AAA	1103	1/1	0.94	0.09	72,72,72,72	0
6	A1JBI	AAA	1107	34/34	0.96	0.06	33,41,45,47	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.



## 6.5 Other polymers [i](#)

There are no such residues in this entry.