



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 28, 2023 – 12:22 pm GMT

PDB ID : 8BCE  
Title : Human Brr2 Helicase Region in complex with C-tail deleted Jab1 and compound 76  
Authors : Vester, K.; Loll, B.; Wahl, M.C.  
Deposited on : 2022-10-15  
Resolution : 2.05 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.

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 : 4.02b-467  
Mogul : 1.8.4, CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.32.1  
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) : 2.32.1

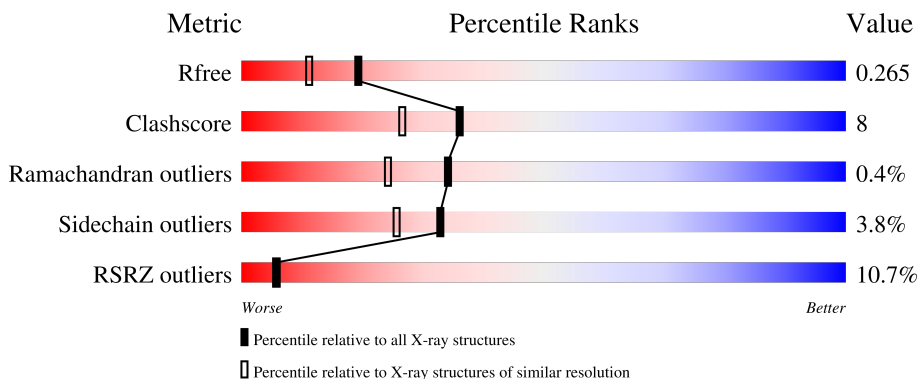
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.05 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	1692 (2.04-2.04)
Clashscore	141614	1773 (2.04-2.04)
Ramachandran outliers	138981	1752 (2.04-2.04)
Sidechain outliers	138945	1752 (2.04-2.04)
RSRZ outliers	127900	1672 (2.04-2.04)

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	B	1747	 11% 77% 20% ..
2	J	263	 7% 86% 14%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	EDO	B	5811	-	-	X	-

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 16532 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 U5 small nuclear ribonucleoprotein 200 kDa helicase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	B	1719	13822	8833	2366	2551	72	0	0	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	390	GLY	-	expression tag	UNP O75643
B	391	ALA	-	expression tag	UNP O75643
B	392	GLU	-	expression tag	UNP O75643
B	393	PHE	-	expression tag	UNP O75643

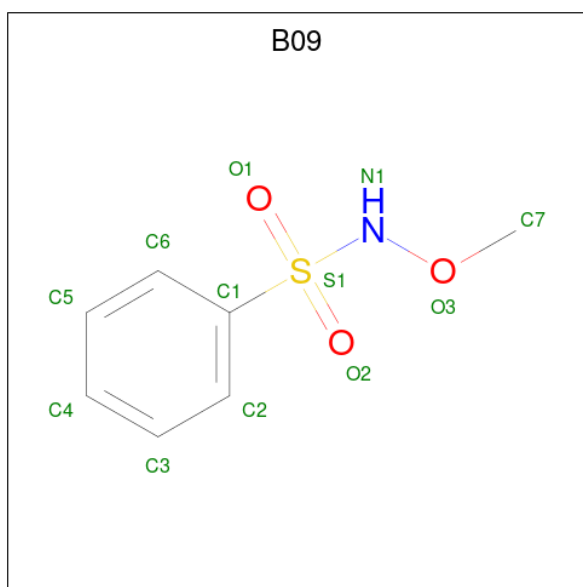
- Molecule 2 is a protein called Pre-mRNA-processing-splicing factor 8.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	J	263	2123	1358	365	388	12	0	0	0

There are 6 discrepancies between the modelled and reference sequences:

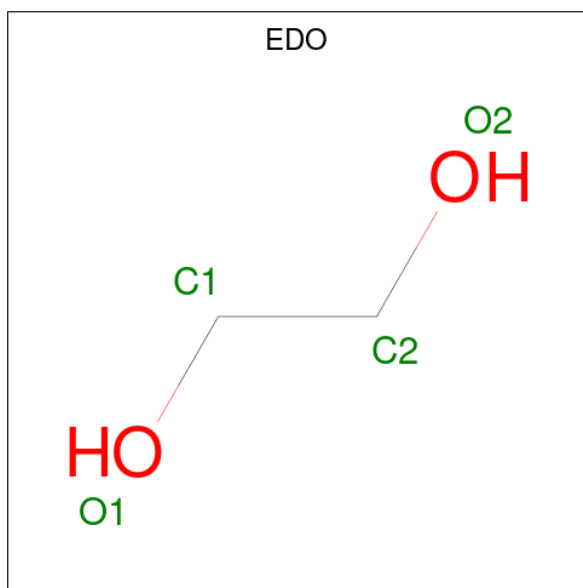
Chain	Residue	Modelled	Actual	Comment	Reference
J	2058	GLY	-	expression tag	UNP Q6P2Q9
J	2059	PRO	-	expression tag	UNP Q6P2Q9
J	2060	LEU	-	expression tag	UNP Q6P2Q9
J	2061	GLY	-	expression tag	UNP Q6P2Q9
J	2062	SER	-	expression tag	UNP Q6P2Q9
J	2063	MET	-	expression tag	UNP Q6P2Q9

- Molecule 3 is N-methoxybenzenesulfonamide (three-letter code: B09) (formula: C<sub>7</sub>H<sub>9</sub>NO<sub>3</sub>S) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
3	B	1	12	7	1	3	1	0	0

- Molecule 4 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula:  $C_2H_6O_2$ ).



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

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	1	Total C O 4 2 2	0	0
4	B	1	Total C O 4 2 2	0	0
4	B	1	Total C O 4 2 2	0	0
4	B	1	Total C O 4 2 2	0	0
4	B	1	Total C O 4 2 2	0	0
4	B	1	Total C O 4 2 2	0	0
4	B	1	Total C O 4 2 2	0	0
4	B	1	Total C O 4 2 2	0	0
4	J	1	Total C O 4 2 2	0	0

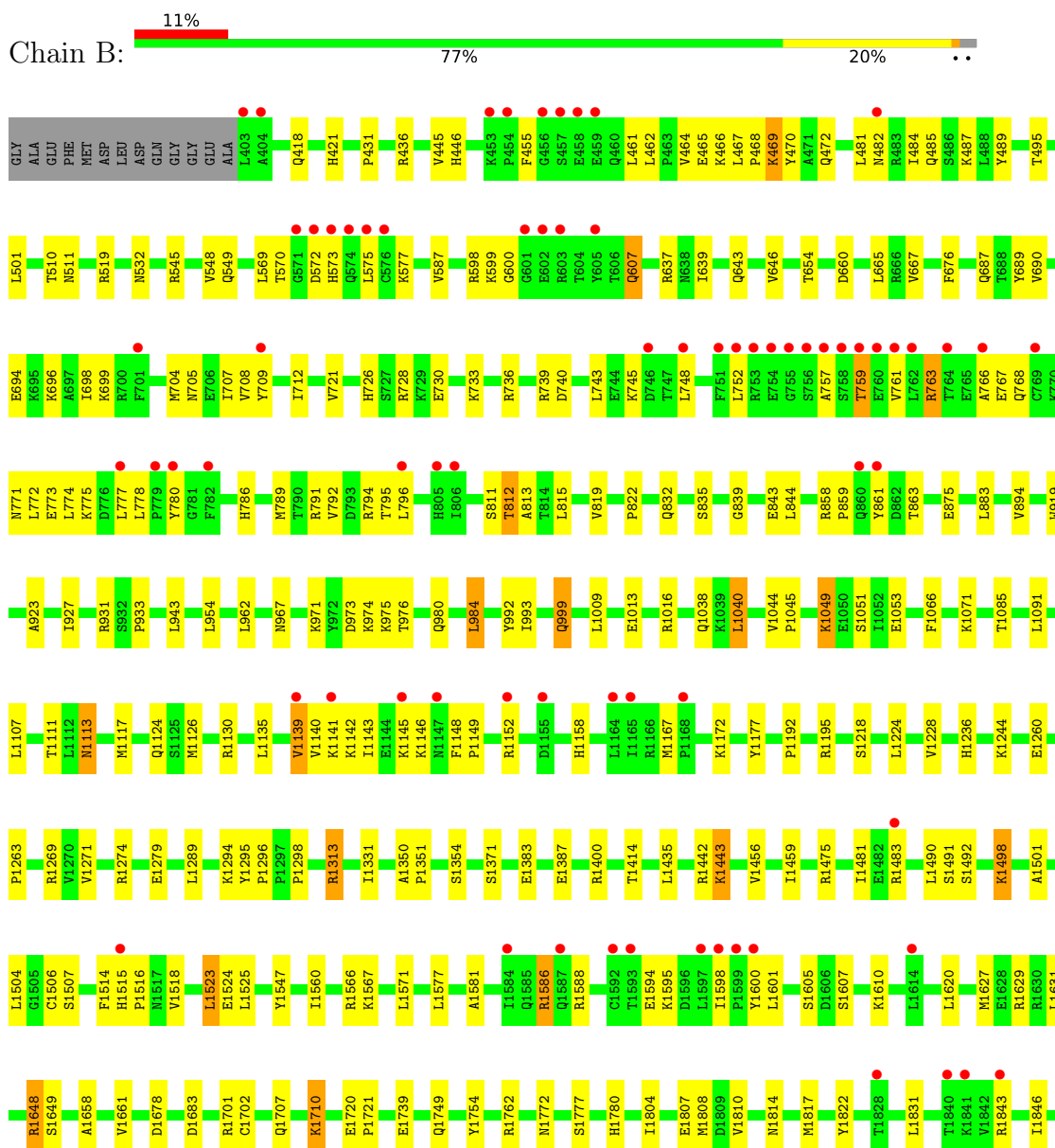
- Molecule 5 is water.

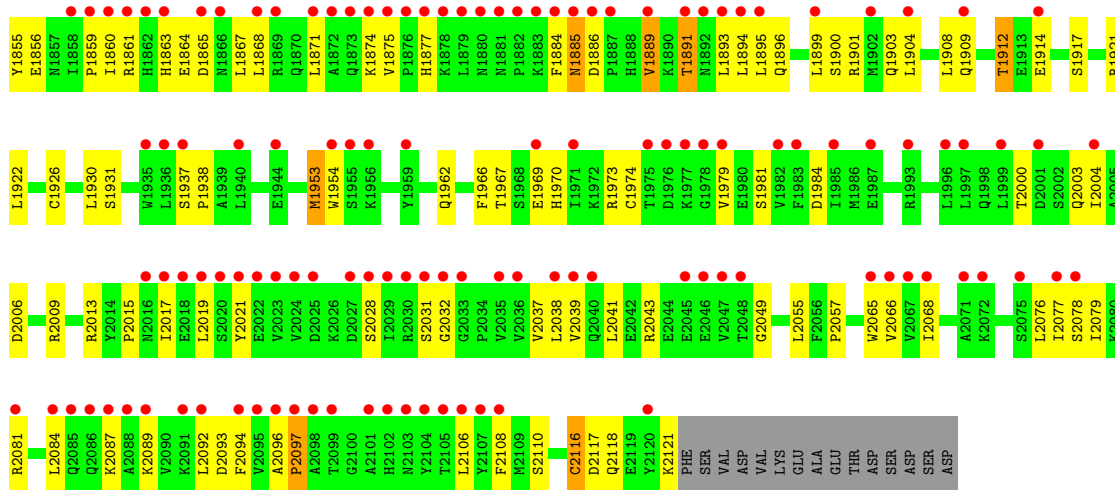
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	449	Total O 449 449	0	2
5	J	78	Total O 78 78	0	0

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

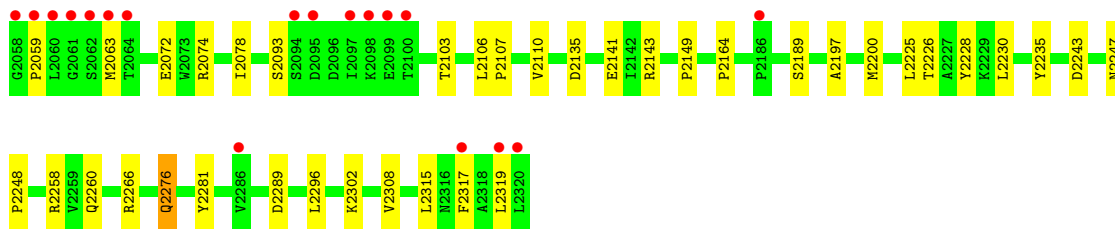
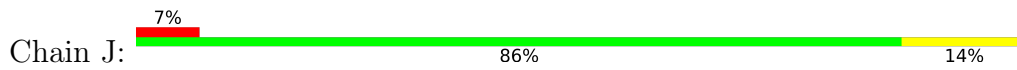
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: U5 small nuclear ribonucleoprotein 200 kDa helicase





• Molecule 2: Pre-mRNA-processing-splicing factor 8





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	100.05Å 119.05Å 188.04Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.51 – 2.05 48.51 – 2.05	Depositor EDS
% Data completeness (in resolution range)	99.0 (48.51-2.05) 99.0 (48.51-2.05)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.02 (at 2.05Å)	Xtrriage
Refinement program	PHENIX 1.20_4459	Depositor
R, $R_{free}$	0.220 , 0.267 0.220 , 0.265	Depositor DCC
$R_{free}$ test set	2096 reflections (1.50%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	39.8	Xtrriage
Anisotropy	0.213	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 45.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	16532	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	63.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.70% 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

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: B09, EDO

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	B	0.46	0/14115	0.64	0/19125
2	J	0.51	0/2190	0.63	0/2981
All	All	0.47	0/16305	0.64	0/22106

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

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	B	13822	0	13969	238	0
2	J	2123	0	2063	21	0
3	B	12	0	9	0	0
4	B	44	0	66	7	0
4	J	4	0	6	0	0
5	B	449	0	0	11	0
5	J	78	0	0	2	0
All	All	16532	0	16113	256	0

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 8.

The worst 5 of 256 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)
2:J:2276:GLN:OE1	5:J:2501:HOH:O	1.94	0.86
1:B:1861:ARG:HH21	1:B:1863:HIS:HB2	1.43	0.82
1:B:763:ARG:HH21	1:B:767:GLU:HG3	1.44	0.81
2:J:2200:MET:HE1	2:J:2230:LEU:HD12	1.63	0.80
1:B:993:ILE:HD12	1:B:1091:LEU:HD23	1.64	0.80

There are no symmetry-related clashes.

## 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	B	1717/1747 (98%)	1649 (96%)	62 (4%)	6 (0%)	41	31
2	J	261/263 (99%)	248 (95%)	12 (5%)	1 (0%)	34	24
All	All	1978/2010 (98%)	1897 (96%)	74 (4%)	7 (0%)	34	24

5 of 7 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	1859	PRO
2	J	2059	PRO
1	B	1885	ASN
1	B	2028	SER
1	B	2057	PRO

### 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	B	1538/1560 (99%)	1479 (96%)	59 (4%)	33	26
2	J	236/236 (100%)	227 (96%)	9 (4%)	33	26
All	All	1774/1796 (99%)	1706 (96%)	68 (4%)	33	26

5 of 68 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	2110	SER
2	J	2063	MET
2	J	2276	GLN
1	B	1040	LEU
1	B	1038	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	532	ASN

### 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 monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

13 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
4	EDO	B	5808	-	3,3,3	0.56	0	2,2,2	0.57	0
4	EDO	B	5805	-	3,3,3	0.50	0	2,2,2	0.54	0
4	EDO	B	5812	-	3,3,3	0.59	0	2,2,2	0.54	0
4	EDO	J	2401	-	3,3,3	0.53	0	2,2,2	1.12	0
4	EDO	B	5807	-	3,3,3	0.56	0	2,2,2	0.37	0
4	EDO	B	5809	-	3,3,3	0.55	0	2,2,2	0.85	0
4	EDO	B	5804	-	3,3,3	0.42	0	2,2,2	1.11	0
4	EDO	B	5810	-	3,3,3	0.64	0	2,2,2	0.28	0
3	B09	B	5801	-	11,12,12	1.42	3 (27%)	13,16,16	3.42	4 (30%)
4	EDO	B	5802	-	3,3,3	0.33	0	2,2,2	0.82	0
4	EDO	B	5806	-	3,3,3	0.44	0	2,2,2	0.80	0
4	EDO	B	5803	-	3,3,3	0.43	0	2,2,2	0.78	0
4	EDO	B	5811	-	3,3,3	0.42	0	2,2,2	0.18	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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	EDO	B	5808	-	-	0/1/1/1	-
4	EDO	B	5805	-	-	0/1/1/1	-
4	EDO	B	5812	-	-	1/1/1/1	-
4	EDO	J	2401	-	-	1/1/1/1	-
4	EDO	B	5807	-	-	0/1/1/1	-
4	EDO	B	5809	-	-	1/1/1/1	-
4	EDO	B	5804	-	-	1/1/1/1	-
4	EDO	B	5810	-	-	0/1/1/1	-
3	B09	B	5801	-	-	0/6/10/10	0/1/1/1
4	EDO	B	5802	-	-	0/1/1/1	-
4	EDO	B	5806	-	-	1/1/1/1	-
4	EDO	B	5803	-	-	1/1/1/1	-
4	EDO	B	5811	-	-	0/1/1/1	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	5801	B09	O1-S1	2.82	1.46	1.43
3	B	5801	B09	O2-S1	2.38	1.46	1.43
3	B	5801	B09	C1-S1	2.32	1.80	1.76

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	5801	B09	O2-S1-O1	-10.66	106.45	119.55
3	B	5801	B09	O1-S1-C1	4.41	113.40	107.97
3	B	5801	B09	C7-O3-N1	3.08	112.97	109.72
3	B	5801	B09	C1-S1-N1	2.02	111.54	107.27

There are no chirality outliers.

5 of 6 torsion outliers are listed below:

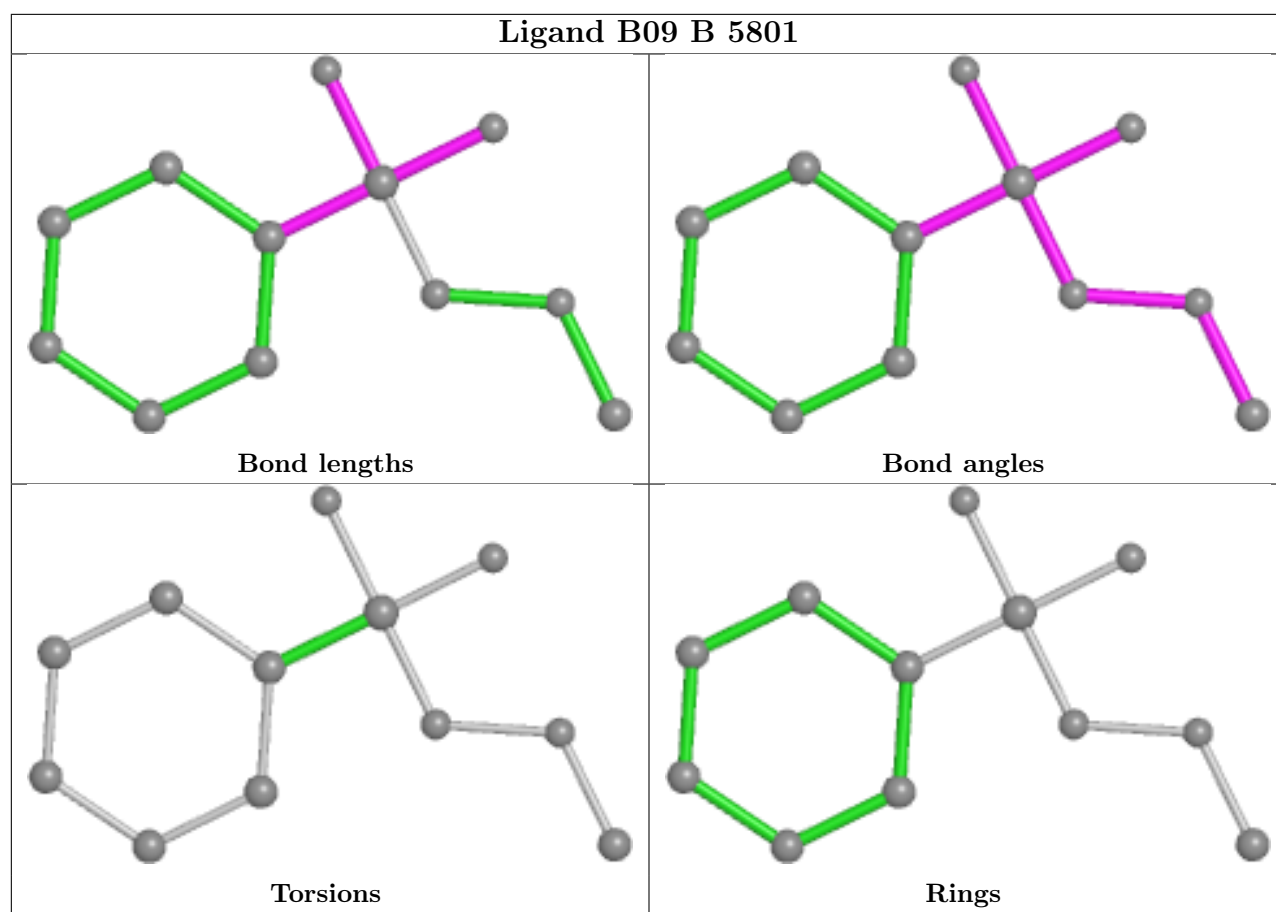
Mol	Chain	Res	Type	Atoms
4	B	5804	EDO	O1-C1-C2-O2
4	B	5812	EDO	O1-C1-C2-O2
4	B	5806	EDO	O1-C1-C2-O2
4	J	2401	EDO	O1-C1-C2-O2
4	B	5809	EDO	O1-C1-C2-O2

There are no ring outliers.

4 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	5809	EDO	1	0
4	B	5802	EDO	1	0
4	B	5803	EDO	1	0
4	B	5811	EDO	4	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 [i](#)

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	B	1719/1747 (98%)	0.45	194 (11%) <b>5</b>   <b>5</b>	26, 55, 128, 176	0
2	J	263/263 (100%)	0.12	18 (6%) <b>17</b>   <b>18</b>	30, 50, 108, 178	0
All	All	1982/2010 (98%)	0.41	212 (10%) <b>6</b>   <b>6</b>	26, 54, 128, 178	0

The worst 5 of 212 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	603	ARG	12.0
2	J	2061	GLY	11.2
1	B	1936	LEU	9.6
1	B	2038	LEU	9.3
1	B	404	ALA	8.9

### 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 monosaccharides in this entry.

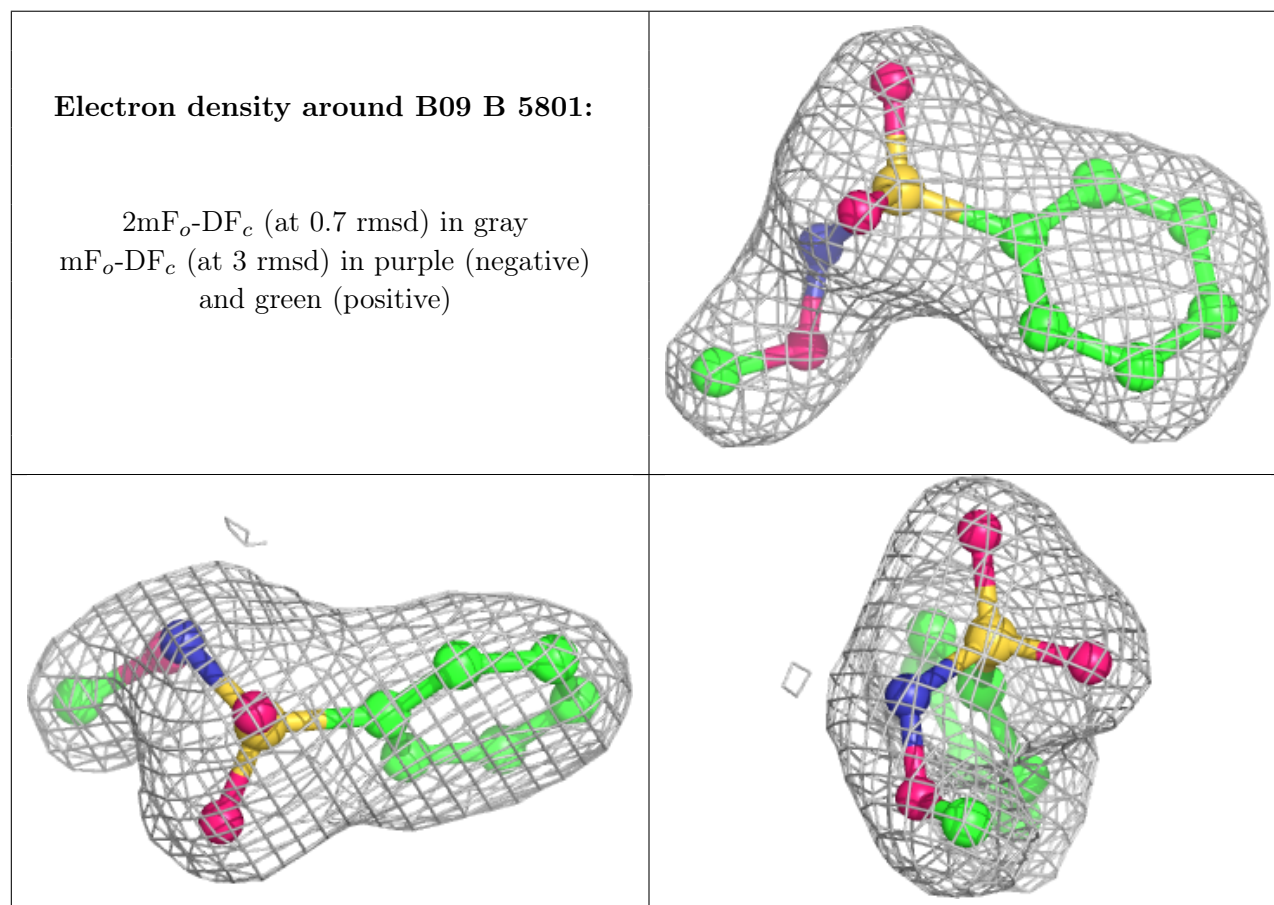
### 6.4 Ligands [i](#)

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
4	EDO	B	5805	4/4	0.78	0.20	64,64,64,65	0
4	EDO	B	5808	4/4	0.80	0.20	49,50,54,55	0
4	EDO	B	5810	4/4	0.82	0.12	53,56,57,63	0
4	EDO	B	5802	4/4	0.84	0.18	38,40,48,49	0
4	EDO	B	5807	4/4	0.85	0.13	59,59,60,68	0
4	EDO	J	2401	4/4	0.85	0.12	42,46,49,51	0
4	EDO	B	5811	4/4	0.86	0.15	47,52,52,55	0
4	EDO	B	5809	4/4	0.86	0.11	32,40,41,44	0
4	EDO	B	5803	4/4	0.87	0.14	54,55,61,67	0
4	EDO	B	5812	4/4	0.92	0.09	42,50,54,57	0
4	EDO	B	5804	4/4	0.94	0.23	48,48,49,50	0
4	EDO	B	5806	4/4	0.95	0.18	56,59,60,64	0
3	B09	B	5801	12/12	0.97	0.11	37,44,46,46	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.