



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 9, 2021 – 02:04 PM EDT

PDB ID : 6W39  
Title : Structure of unphosphorylated IRE1 in complex with G-1749  
Authors : Ferri, E.; Wang, W.; Joachim, R.; Mortara, K.  
Deposited on : 2020-03-09  
Resolution : 1.74 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.

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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 : 2.20  
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) : 2.20

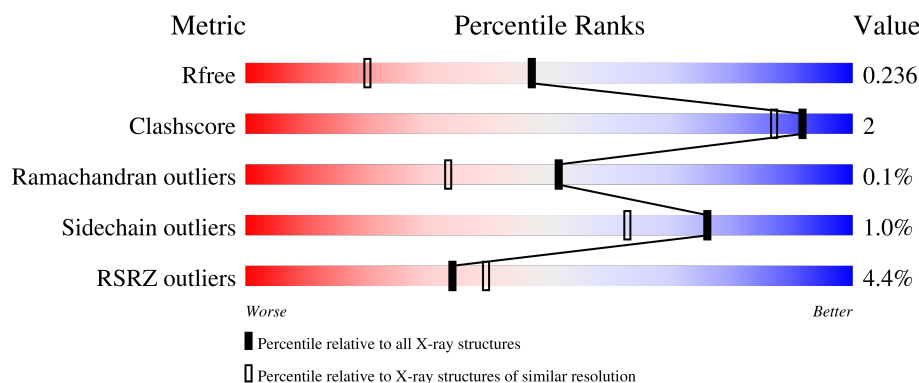
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.74 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	3764 (1.76-1.72)
Clashscore	141614	3923 (1.76-1.72)
Ramachandran outliers	138981	3878 (1.76-1.72)
Sidechain outliers	138945	3878 (1.76-1.72)
RSRZ outliers	127900	3705 (1.76-1.72)

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	A	431	<div> <div>3%</div> <div> <div></div> <div>84%</div> <div>•</div> <div>13%</div> </div> </div>
1	B	431	<div> <div>4%</div> <div> <div></div> <div>82%</div> <div>•</div> <div>13%</div> </div> </div>

## 2 Entry composition [i](#)

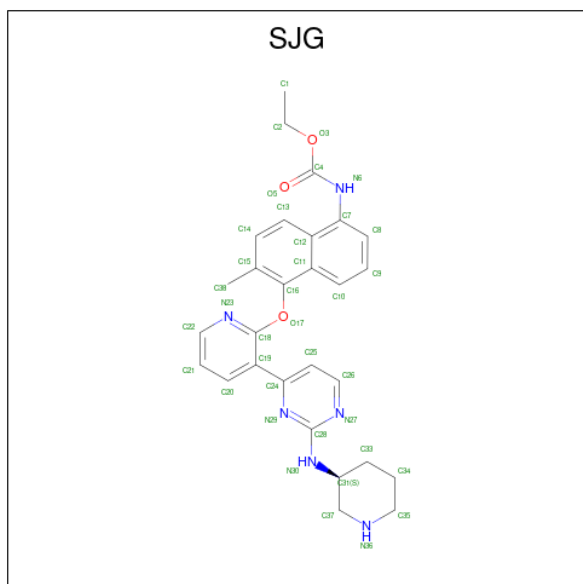
There are 3 unique types of molecules in this entry. The entry contains 12165 atoms, of which 5763 are hydrogens and 0 are deuteriums.

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 Serine/threonine-protein kinase/endoribonuclease IRE1.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	374	Total	C	H	N	O	S	0	3	0
			5854	1906	2884	511	535	18			
1	B	374	Total	C	H	N	O	S	0	4	0
			5847	1907	2877	513	534	16			

- Molecule 2 is ethyl {N}-[6-methyl-5-[3-[2-[(3 {S})-piperidin-3-yl]amino]pyrimidin-4-yl]pyridin-2-yl]oxy-naphthalen-1-yl]carbamate (three-letter code: SJG) (formula: C<sub>28</sub>H<sub>30</sub>N<sub>6</sub>O<sub>3</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	H	N	O	0	0
			38	28	1	6	3		
2	B	1	Total	C	H	N	O	0	0
			38	28	1	6	3		


- Molecule 3 is water.

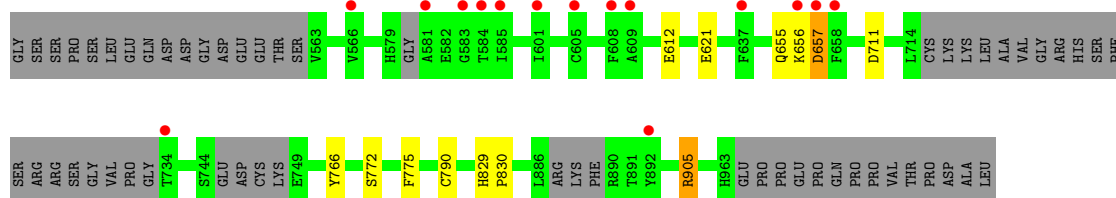
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	188	Total 188	O 188	0	0
3	B	200	Total 200	O 200	0	0

### 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.

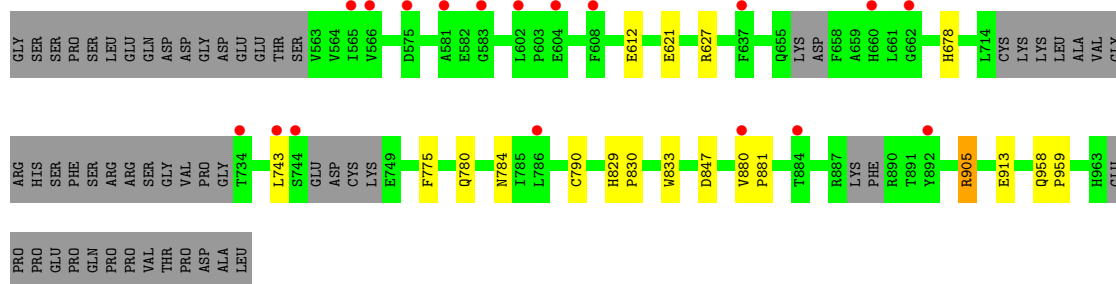
- Molecule 1: Serine/threonine-protein kinase/endoribonuclease IRE1

Chain A: 



- Molecule 1: Serine/threonine-protein kinase/endoribonuclease IRE1

Chain B: 



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	77.71Å 82.92Å 164.62Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	82.31 – 1.74 82.31 – 1.74	Depositor EDS
% Data completeness (in resolution range)	69.7 (82.31-1.74) 69.7 (82.31-1.74)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.97 (at 1.74Å)	Xtriage
Refinement program	PHENIX 1.9_1692	Depositor
R, $R_{free}$	0.195 , 0.235 0.198 , 0.236	Depositor DCC
$R_{free}$ test set	3927 reflections (5.11%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	29.2	Xtriage
Anisotropy	0.013	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.39 , 49.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	12165	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	49.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 36.96 % 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 4.6122e-04. 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.

## 5 Model quality

### 5.1 Standard geometry

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

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	0.42	0/3054	0.55	0/4136
1	B	0.42	0/3048	0.56	0/4127
All	All	0.42	0/6102	0.55	0/8263

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	A	2970	2884	2874	9	0
1	B	2970	2877	2869	11	0
2	A	37	1	0	1	0
2	B	37	1	0	1	0
3	A	188	0	0	2	0
3	B	200	0	0	1	0
All	All	6402	5763	5743	19	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 2.

All (19) 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:B:678:HIS:ND1	3:B:1102:HOH:O	2.27	0.67
1:B:847:ASP:OD1	1:B:905:ARG:NH2	2.35	0.59
1:A:612:GLU:OE2	2:A:1001:SJG:N6	2.42	0.52
1:A:621[B]:GLU:OE2	3:A:1101:HOH:O	2.20	0.50
1:B:829:HIS:CG	1:B:830:PRO:HD2	2.47	0.49
1:A:775:PHE:CE1	1:A:790:CYS:HB3	2.49	0.48
1:A:621[B]:GLU:H	1:A:621[B]:GLU:CD	2.18	0.46
1:B:612:GLU:OE2	2:B:1001:SJG:N6	2.49	0.46
1:A:829:HIS:CG	1:A:830:PRO:HD2	2.52	0.45
1:A:656:LYS:O	1:A:657:ASP:CB	2.66	0.44
1:B:775:PHE:CE1	1:B:790:CYS:HB3	2.52	0.44
1:A:766:TYR:HA	1:A:772:SER:O	2.20	0.42
1:B:780:GLN:HG2	1:B:784:ASN:ND2	2.35	0.42
1:A:905:ARG:NH1	3:A:1121:HOH:O	2.52	0.41
1:B:830:PRO:HA	1:B:833:TRP:CD2	2.55	0.41
1:B:880:VAL:N	1:B:881:PRO:CD	2.83	0.41
1:B:621[A]:GLU:HG2	1:B:621[A]:GLU:O	2.21	0.41
1:A:621[A]:GLU:OE1	1:B:627:ARG:NH1	2.54	0.40
1:B:958:GLN:N	1:B:959:PRO:CD	2.85	0.40

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	A	367/431 (85%)	355 (97%)	11 (3%)	1 (0%)	41	23
1	B	367/431 (85%)	351 (96%)	16 (4%)	0	100	100
All	All	734/862 (85%)	706 (96%)	27 (4%)	1 (0%)	51	33

All (1) Ramachandran outliers are listed below:



Mol	Chain	Res	Type
1	A	657	ASP

### 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	315/382 (82%)	312 (99%)	3 (1%)	76	63
1	B	313/382 (82%)	310 (99%)	3 (1%)	76	63
All	All	628/764 (82%)	622 (99%)	6 (1%)	76	63

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	655	GLN
1	A	711	ASP
1	A	905	ARG
1	B	743	LEU
1	B	905	ARG
1	B	913	GLU

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 monosaccharides 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
2	SJG	A	1001	-	40,41,41	0.78	1 (2%)	51,56,56	2.56	15 (29%)
2	SJG	B	1001	-	40,41,41	0.96	1 (2%)	51,56,56	2.48	14 (27%)

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	SJG	A	1001	-	-	7/19/27/27	0/5/5/5
2	SJG	B	1001	-	-	7/19/27/27	0/5/5/5

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	1001	SJG	C28-N30	4.13	1.40	1.34
2	A	1001	SJG	C28-N30	3.37	1.39	1.34

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1001	SJG	C16-O17-C18	9.41	126.52	116.88
2	B	1001	SJG	C16-O17-C18	8.69	125.79	116.88
2	B	1001	SJG	C26-N27-C28	6.47	121.18	115.45
2	A	1001	SJG	C24-N29-C28	5.94	121.59	116.69
2	A	1001	SJG	C26-N27-C28	5.45	120.29	115.45
2	B	1001	SJG	N27-C28-N29	-5.09	121.73	126.55
2	B	1001	SJG	O3-C4-N6	5.05	117.56	109.32
2	B	1001	SJG	C24-N29-C28	5.02	120.83	116.69
2	A	1001	SJG	O3-C4-N6	4.99	117.47	109.32

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1001	SJG	N27-C28-N29	-4.75	122.05	126.55
2	B	1001	SJG	C25-C26-N27	-4.41	118.48	123.96
2	A	1001	SJG	O17-C18-C19	4.35	120.94	116.61
2	A	1001	SJG	C25-C26-N27	-3.92	119.09	123.96
2	B	1001	SJG	O3-C4-O5	-3.56	117.41	124.25
2	A	1001	SJG	C25-C24-N29	-3.56	117.36	121.97
2	A	1001	SJG	O3-C4-O5	-3.49	117.55	124.25
2	A	1001	SJG	C33-C31-N30	-3.25	105.54	110.60
2	B	1001	SJG	C25-C24-N29	-3.03	118.04	121.97
2	A	1001	SJG	C15-C16-C11	-2.89	118.77	122.48
2	A	1001	SJG	C12-C7-N6	2.70	122.93	118.36
2	B	1001	SJG	C26-C25-C24	2.64	119.71	117.22
2	A	1001	SJG	C26-C25-C24	2.52	119.60	117.22
2	B	1001	SJG	O17-C18-C19	2.48	119.08	116.61
2	A	1001	SJG	C22-N23-C18	2.47	122.35	116.43
2	B	1001	SJG	C21-C22-N23	-2.47	119.40	123.43
2	B	1001	SJG	C22-N23-C18	2.40	122.18	116.43
2	B	1001	SJG	O17-C16-C15	2.39	123.55	118.35
2	A	1001	SJG	C14-C15-C16	2.10	120.98	117.68
2	B	1001	SJG	C15-C16-C11	-2.06	119.84	122.48

There are no chirality outliers.

All (14) torsion outliers are listed below:

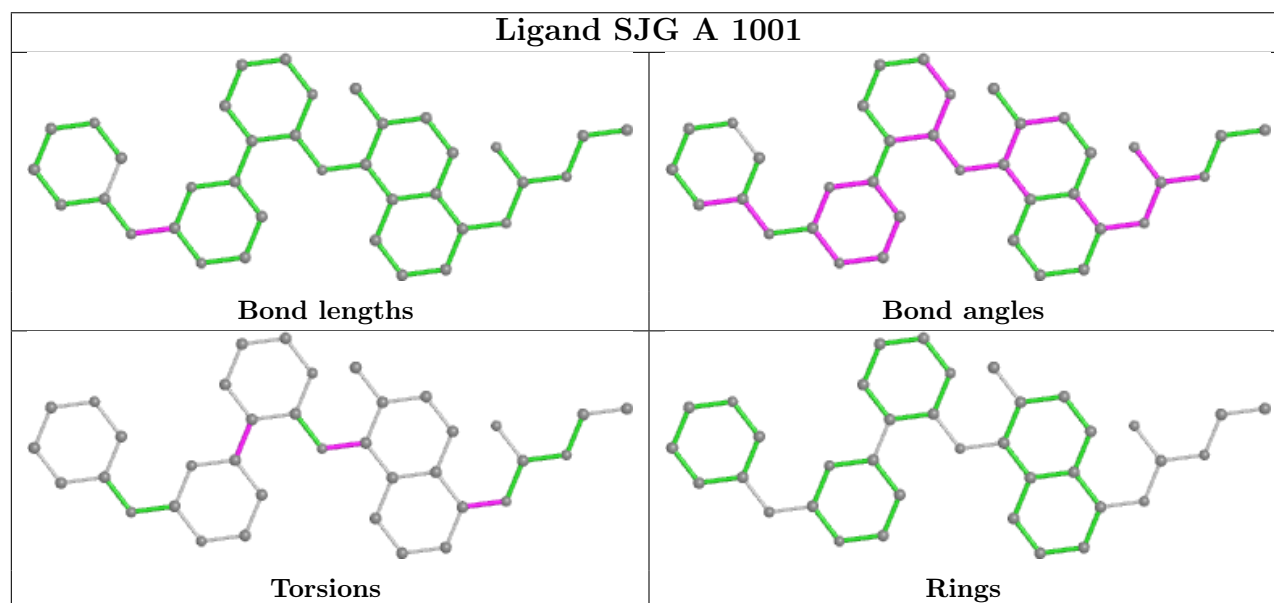
Mol	Chain	Res	Type	Atoms
2	A	1001	SJG	C20-C19-C24-C25
2	A	1001	SJG	C20-C19-C24-N29
2	A	1001	SJG	C15-C16-O17-C18
2	B	1001	SJG	C15-C16-O17-C18
2	B	1001	SJG	C20-C19-C24-C25
2	A	1001	SJG	C18-C19-C24-C25
2	A	1001	SJG	C8-C7-N6-C4
2	B	1001	SJG	C8-C7-N6-C4
2	B	1001	SJG	C20-C19-C24-N29
2	B	1001	SJG	C18-C19-C24-C25
2	A	1001	SJG	C18-C19-C24-N29
2	A	1001	SJG	C12-C7-N6-C4
2	B	1001	SJG	C18-C19-C24-N29
2	B	1001	SJG	C12-C7-N6-C4

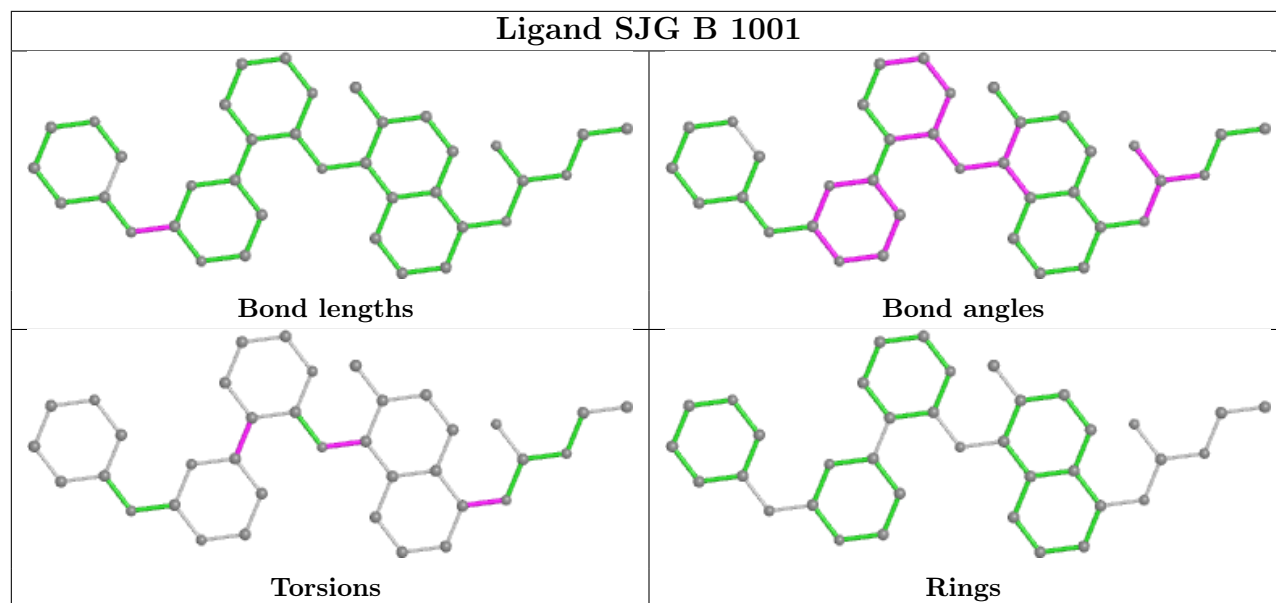
There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1001	SJG	1	0
2	B	1001	SJG	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 [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data

### 6.1 Protein, DNA and RNA chains

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	374/431 (86%)	0.23	15 (4%) 38 43	17, 41, 81, 106	0
1	B	374/431 (86%)	0.32	18 (4%) 30 35	18, 41, 85, 102	0
All	All	748/862 (86%)	0.27	33 (4%) 34 39	17, 41, 83, 106	0

All (33) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	880	VAL	5.4
1	B	608	PHE	4.7
1	B	566	VAL	4.6
1	B	637	PHE	4.4
1	A	637	PHE	4.3
1	A	581	ALA	4.2
1	A	734	THR	3.7
1	B	734	THR	3.7
1	A	656	LYS	3.3
1	B	660	HIS	3.3
1	B	565	ILE	3.2
1	B	581	ALA	3.0
1	B	884	THR	3.0
1	A	609	ALA	2.9
1	A	608	PHE	2.9
1	B	602	LEU	2.7
1	B	604	GLU	2.7
1	A	657	ASP	2.6
1	A	566	VAL	2.6
1	A	583	GLY	2.6
1	B	583	GLY	2.6
1	B	743	LEU	2.6
1	A	601	ILE	2.5
1	B	892	TYR	2.5

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Mol	Chain	Res	Type	RSRZ
1	B	662	GLY	2.4
1	A	585	ILE	2.4
1	B	744	SER	2.4
1	A	584	THR	2.4
1	A	892	TYR	2.3
1	A	605	CYS	2.2
1	B	786	LEU	2.2
1	B	575	ASP	2.2
1	A	658	PHE	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 monosaccharides in this entry.

## 6.4 Ligands [i](#)

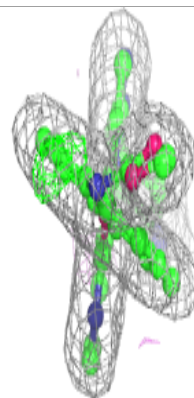
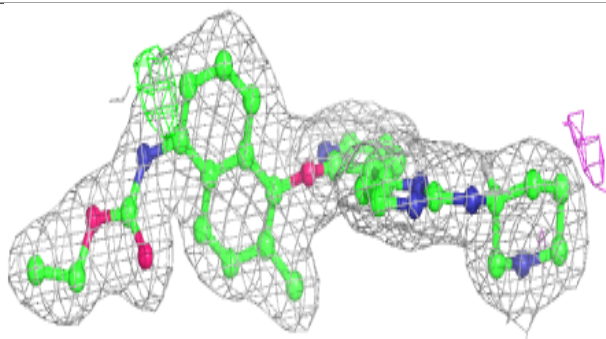
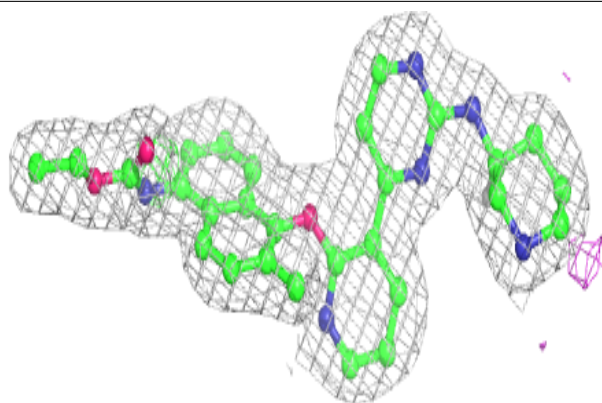
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 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
2	SJG	A	1001	37/37	0.95	0.10	24,31,40,42	0
2	SJG	B	1001	37/37	0.96	0.10	25,32,40,44	0

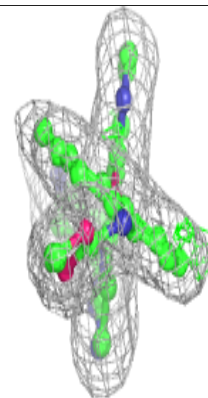
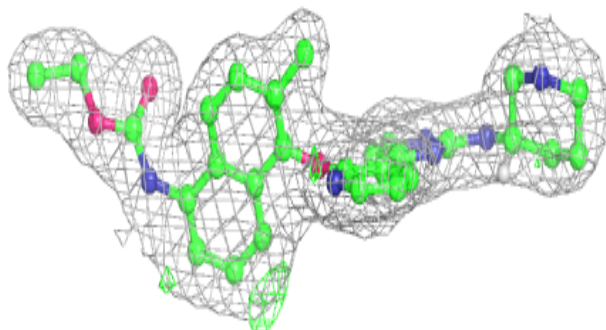
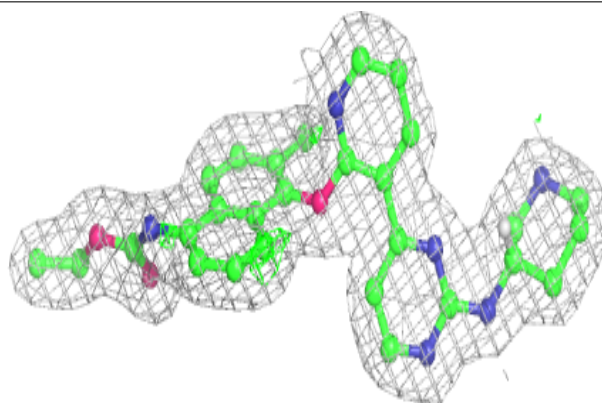
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

**Electron density around SJG A 1001:**

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

**Electron density around SJG B 1001:**

$2mF_o-DF_c$  (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.