



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 22, 2024 – 10:57 AM EDT

PDB ID : 5KX7  
Title : Irak4-inhibitor co-structure  
Authors : Fischmann, T.O.  
Deposited on : 2016-07-20  
Resolution : 2.80 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>.

---

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 : 2.37.1  
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) : 2.37.1

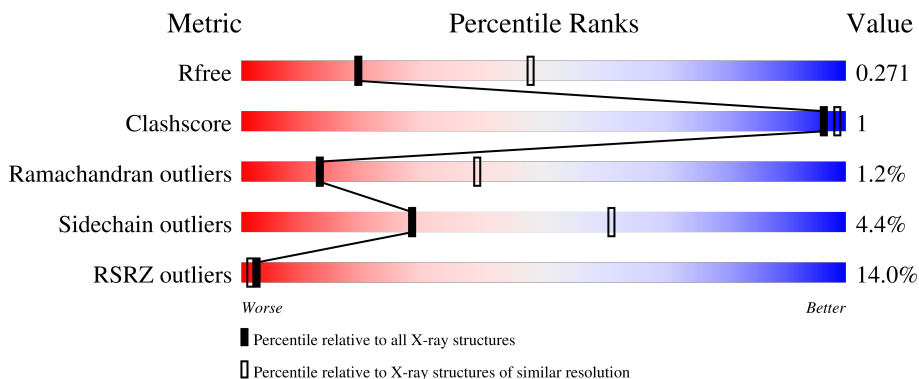
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.80 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	3140 (2.80-2.80)
Clashscore	141614	3569 (2.80-2.80)
Ramachandran outliers	138981	3498 (2.80-2.80)
Sidechain outliers	138945	3500 (2.80-2.80)
RSRZ outliers	127900	3078 (2.80-2.80)

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	301	
1	B	301	

## 2 Entry composition [i](#)

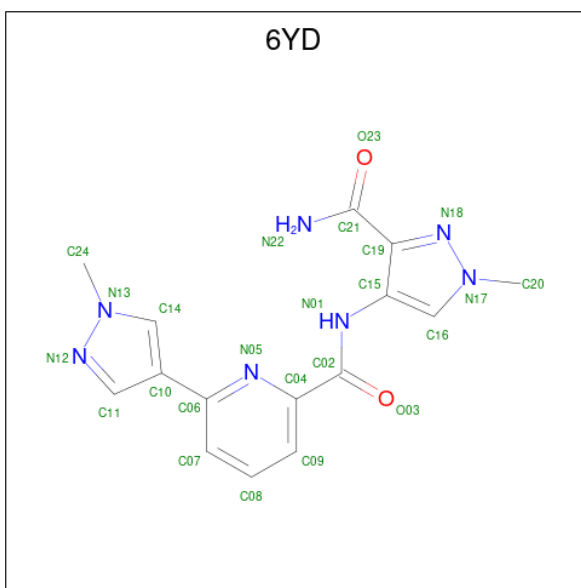
There are 2 unique types of molecules in this entry. The entry contains 4159 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Interleukin-1 receptor-associated kinase 4.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	P	S			
1	A	240	Total	C	N	O	P	S	0	0	2
			1868	1166	313	372	3	14			
1	B	289	Total	C	N	O	P	S	0	0	3
			2267	1418	383	449	3	14			

- Molecule 2 is {N}-(3-aminocarbonyl-1-methyl-pyrazol-4-yl)-6-(1-methylpyrazol-4-yl)pyridi ne-2-carboxamide (three-letter code: 6YD) (formula: C<sub>15</sub>H<sub>15</sub>N<sub>7</sub>O<sub>2</sub>).

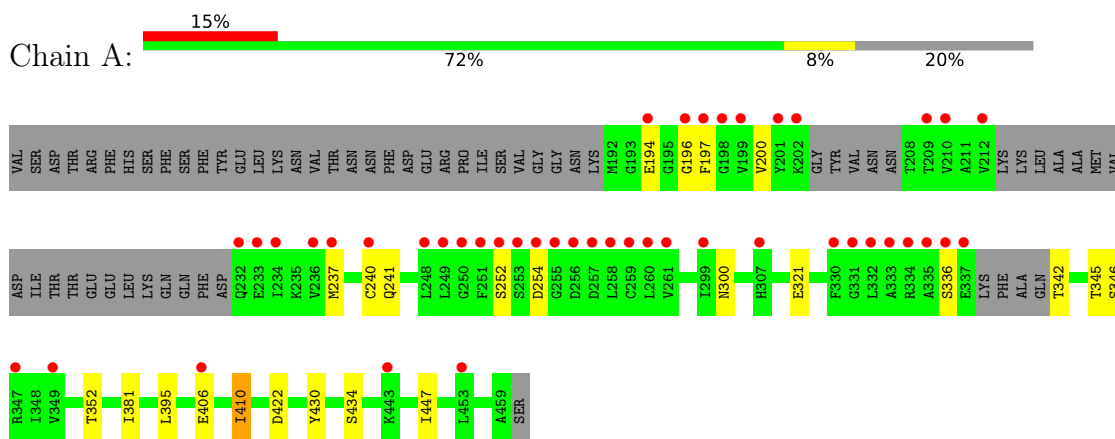


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	B	1	Total	C	N	O	0	0
			24	15	7	2		

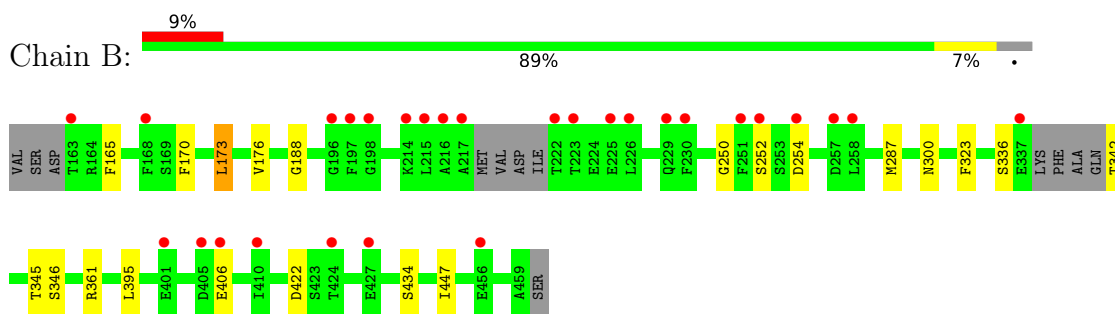
### 3 Residue-property plots [i](#)

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: Interleukin-1 receptor-associated kinase 4



- Molecule 1: Interleukin-1 receptor-associated kinase 4



## 4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	87.80Å 114.28Å 139.44Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	39.32 – 2.80 39.32 – 2.80	Depositor EDS
% Data completeness (in resolution range)	99.7 (39.32-2.80) 99.7 (39.32-2.80)	Depositor EDS
$R_{merge}$	0.08	Depositor
$R_{sym}$	0.08	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.48 (at 2.81Å)	Xtrriage
Refinement program	BUSTER 2.11.6	Depositor
R, $R_{free}$	0.211 , 0.250 0.222 , 0.271	Depositor DCC
$R_{free}$ test set	872 reflections (4.94%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	69.4	Xtrriage
Anisotropy	0.839	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.38 , 81.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	4159	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	93.0	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 33.62 % 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 7.7717e-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: 6YD, SEP, TPO

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	0.53	0/1862	0.64	0/2508
1	B	0.53	0/2271	0.64	0/3060
All	All	0.53	0/4133	0.64	0/5568

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	1868	0	1843	4	0
1	B	2267	0	2225	5	0
2	B	24	0	0	0	0
All	All	4159	0	4068	8	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 1.

All (8) 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:410:ILE:HD12	1:A:430:TYR:HB2	1.90	0.53
1:A:352:THR:CG2	1:B:361:ARG:HA	2.42	0.49
1:B:165:PHE:HB3	1:B:250:GLY:HA2	1.99	0.44
1:B:173:LEU:HA	1:B:176:VAL:HG22	1.99	0.44
1:A:381:ILE:HG21	1:A:410:ILE:HD11	2.02	0.41
1:A:300:ASN:HA	1:A:447:ILE:HG21	2.01	0.41
1:B:300:ASN:HA	1:B:447:ILE:HG21	2.01	0.41
1:B:287:MET:HE1	1:B:323:PHE:HB2	2.04	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	230/301 (76%)	212 (92%)	15 (6%)	3 (1%)	12	36
1	B	281/301 (93%)	264 (94%)	14 (5%)	3 (1%)	14	41
All	All	511/602 (85%)	476 (93%)	29 (6%)	6 (1%)	13	39

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	406	GLU
1	B	406	GLU
1	B	170	PHE
1	B	188	GLY
1	A	321	GLU
1	A	196	GLY

### 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	203/259 (78%)	190 (94%)	13 (6%)	17	45
1	B	247/259 (95%)	240 (97%)	7 (3%)	43	77
All	All	450/518 (87%)	430 (96%)	20 (4%)	28	61

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	194	GLU
1	A	197	PHE
1	A	200	VAL
1	A	237	MET
1	A	240	CYS
1	A	241	GLN
1	A	252	SER
1	A	254	ASP
1	A	336	SER
1	A	395	LEU
1	A	410	ILE
1	A	422	ASP
1	A	434	SER
1	B	173	LEU
1	B	252	SER
1	B	254	ASP
1	B	336	SER
1	B	395	LEU
1	B	422	ASP
1	B	434	SER

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

6 non-standard protein/DNA/RNA residues 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
1	TPO	A	342	1	8,10,11	0.87	0	10,14,16	1.18	1 (10%)
1	SEP	B	346	1	8,9,10	0.90	0	8,12,14	1.50	3 (37%)
1	TPO	B	342	1	8,10,11	0.88	0	10,14,16	1.14	1 (10%)
1	TPO	B	345	1	8,10,11	1.30	1 (12%)	10,14,16	1.02	1 (10%)
1	SEP	A	346	1	8,9,10	0.86	0	8,12,14	1.44	2 (25%)
1	TPO	A	345	1	8,10,11	1.30	2 (25%)	10,14,16	1.11	1 (10%)

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
1	TPO	A	342	1	-	2/9/11/13	-
1	SEP	B	346	1	-	0/5/8/10	-
1	TPO	B	342	1	-	2/9/11/13	-
1	TPO	B	345	1	-	2/9/11/13	-
1	SEP	A	346	1	-	0/5/8/10	-
1	TPO	A	345	1	-	2/9/11/13	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	345	TPO	CB-CA	2.56	1.59	1.53
1	A	345	TPO	CB-CA	2.49	1.59	1.53
1	A	345	TPO	CG2-CB	2.01	1.56	1.51

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	345	TPO	O2P-P-OG1	2.56	117.47	105.99
1	B	345	TPO	O2P-P-OG1	2.54	117.38	105.99
1	B	346	SEP	OG-CB-CA	2.50	110.58	108.14
1	A	342	TPO	O2P-P-OG1	2.39	116.68	105.99
1	A	346	SEP	OG-CB-CA	2.36	110.45	108.14
1	B	346	SEP	P-OG-CB	-2.29	112.00	118.30
1	B	346	SEP	OG-P-O1P	2.25	112.77	106.47
1	B	342	TPO	OG1-P-O1P	2.03	117.24	109.39
1	A	346	SEP	O3P-P-OG	2.01	112.08	106.73

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	342	TPO	O-C-CA-CB
1	A	342	TPO	CB-OG1-P-O1P
1	A	345	TPO	N-CA-CB-OG1
1	A	345	TPO	O-C-CA-CB
1	B	342	TPO	O-C-CA-CB
1	B	345	TPO	N-CA-CB-OG1
1	B	345	TPO	O-C-CA-CB
1	B	342	TPO	CB-OG1-P-O2P

There are no ring outliers.

No monomer is involved in short contacts.

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

1 ligand is 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	6YD	B	9901	-	20,26,26	1.12	1 (5%)	24,37,37	0.89	1 (4%)

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	6YD	B	9901	-	-	0/8/16/16	0/3/3/3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	9901	6YD	C16-C15	3.90	1.42	1.38

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	9901	6YD	C16-C15-C19	-2.84	102.14	104.91

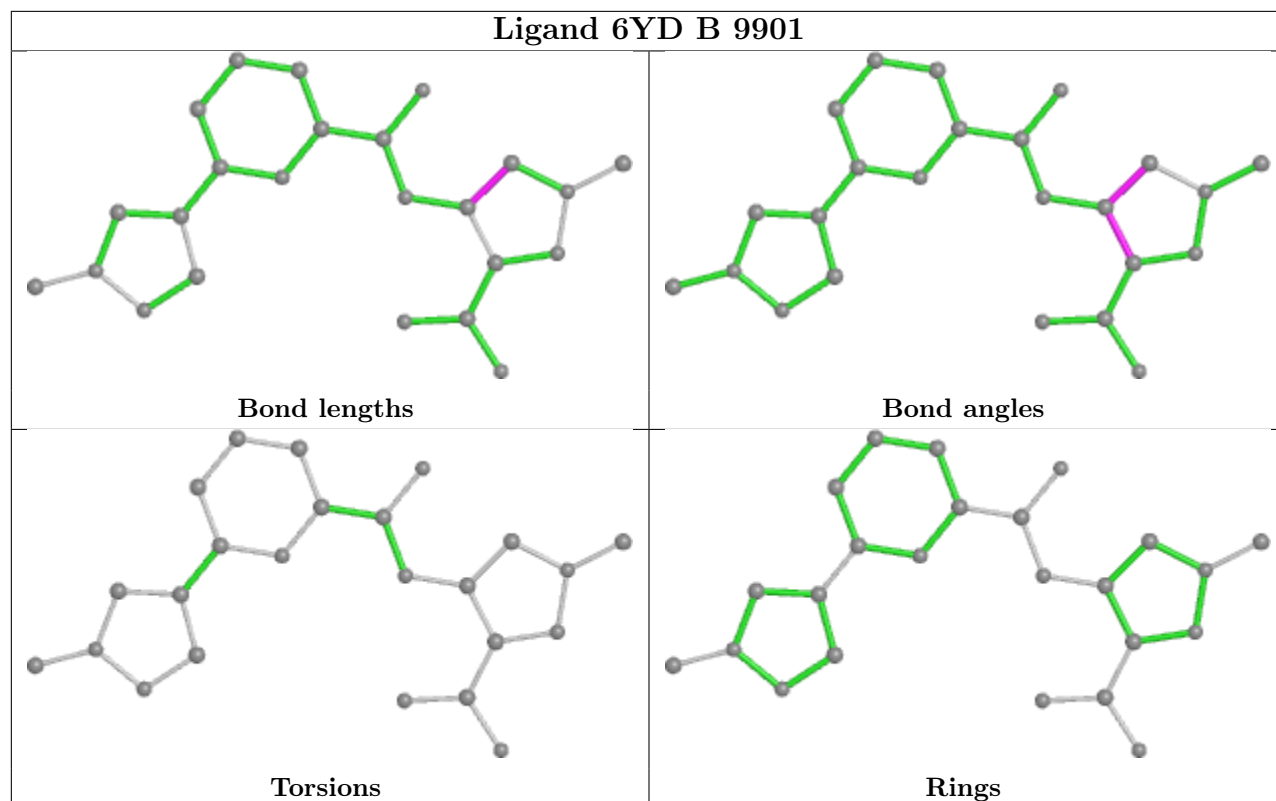
There are no chirality outliers.

There are no torsion outliers.

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.



## 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	237/301 (78%)	1.18	45 (18%) <b>1</b> <b>1</b>	54, 91, 169, 182	0
1	B	286/301 (95%)	0.58	28 (9%) <b>7</b> <b>4</b>	50, 83, 123, 139	0
All	All	523/602 (86%)	0.86	73 (13%) <b>2</b> <b>1</b>	50, 86, 158, 182	0

All (73) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	259	CYS	10.3
1	A	234	ILE	9.7
1	A	252	SER	8.9
1	A	253	SER	8.8
1	A	197	PHE	8.2
1	A	333	ALA	7.9
1	A	251	PHE	7.6
1	A	233	GLU	7.4
1	A	258	LEU	7.0
1	A	236	VAL	6.8
1	B	163	THR	6.5
1	A	332	LEU	6.5
1	A	334	ARG	6.1
1	A	198	GLY	6.1
1	A	196	GLY	6.1
1	A	336	SER	5.6
1	A	249	LEU	5.5
1	A	256	ASP	5.3
1	A	260	LEU	5.3
1	A	212	VAL	4.9
1	A	248	LEU	4.9
1	A	237	MET	4.7
1	A	201	TYR	4.6
1	A	255	GLY	4.5

*Continued on next page...*

*Continued from previous page...*

<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	A	261	VAL	4.4
1	B	226	LEU	4.4
1	B	216	ALA	4.4
1	A	250	GLY	4.3
1	B	223	THR	4.3
1	A	331	GLY	4.1
1	A	257	ASP	4.1
1	B	225	GLU	4.0
1	A	335	ALA	4.0
1	A	330	PHE	3.9
1	A	349	VAL	3.9
1	A	254	ASP	3.8
1	B	215	LEU	3.8
1	B	230	PHE	3.7
1	A	347	ARG	3.7
1	A	202	LYS	3.7
1	A	337	GLU	3.7
1	B	197	PHE	3.4
1	B	254	ASP	3.3
1	A	210	VAL	3.3
1	B	217	ALA	3.3
1	B	258	LEU	3.3
1	A	194	GLU	3.2
1	A	232	GLN	3.1
1	A	240	CYS	3.0
1	B	257	ASP	3.0
1	B	222	THR	2.8
1	A	209	THR	2.7
1	B	196	GLY	2.7
1	B	406	GLU	2.6
1	A	199	VAL	2.6
1	B	424	THR	2.5
1	B	214	LYS	2.5
1	A	406	GLU	2.4
1	B	198	GLY	2.4
1	B	168	PHE	2.4
1	A	443	LYS	2.3
1	B	229	GLN	2.3
1	A	299	ILE	2.2
1	B	252	SER	2.1
1	B	401	GLU	2.1
1	B	405	ASP	2.1

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	RSRZ
1	B	427	GLU	2.1
1	B	456	GLU	2.1
1	B	251	PHE	2.1
1	B	337	GLU	2.1
1	A	453	LEU	2.0
1	A	307	HIS	2.0
1	B	410	ILE	2.0

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

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
1	SEP	A	346	10/11	0.66	0.26	144,146,152,152	0
1	TPO	A	342	11/12	0.71	0.35	145,147,151,152	0
1	SEP	B	346	10/11	0.75	0.17	115,120,128,128	0
1	TPO	B	342	11/12	0.82	0.22	125,131,138,139	0
1	TPO	B	345	11/12	0.94	0.12	110,115,117,117	0
1	TPO	A	345	11/12	0.94	0.20	140,143,145,146	0

## 6.3 Carbohydrates [\(i\)](#)

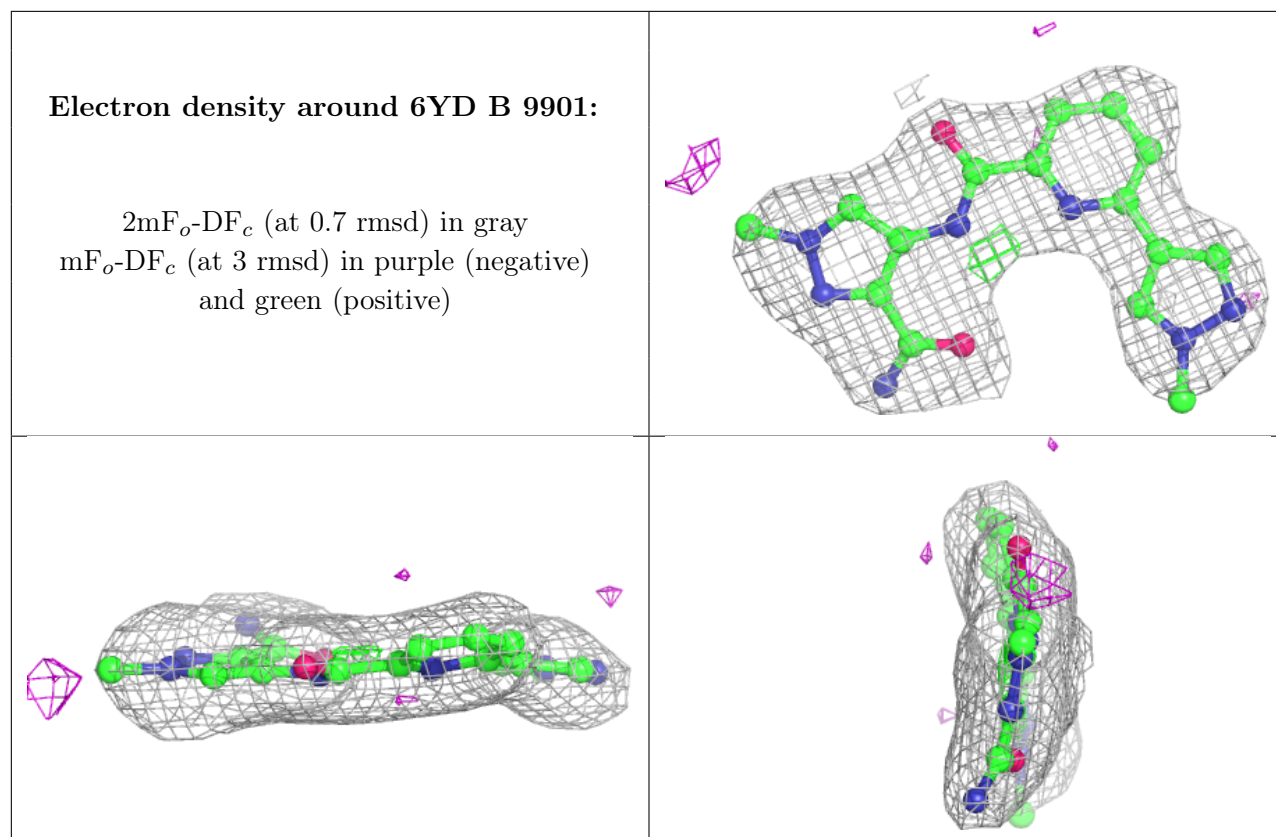
There are no monosaccharides in this entry.

## 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(Å <sup>2</sup> )	Q<0.9
2	6YD	B	9901	24/24	0.95	0.20	47,64,79,80	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.