



# wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 22, 2020 – 07:23 AM BST

PDB ID : 6O8C  
Title : Crystal structure of STING CTT in complex with TBK1  
Authors : Li, P.; Zhao, B.; Du, F.  
Deposited on : 2019-03-09  
Resolution : 3.17 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 : 2.13.1  
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) : 2.13.1

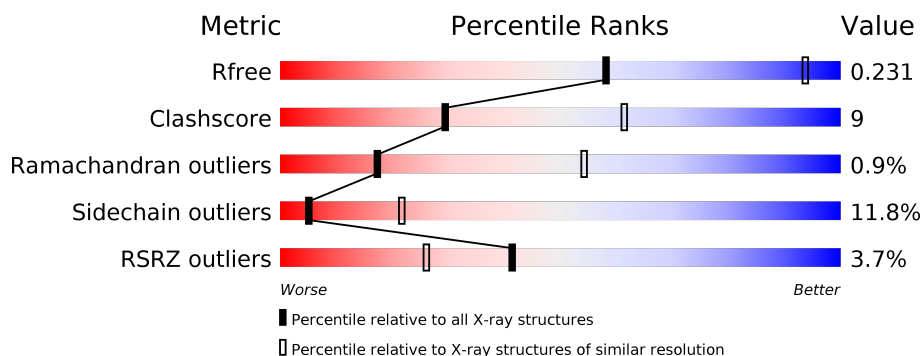
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.17 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	1467 (3.20-3.16)
Clashscore	141614	1599 (3.20-3.16)
Ramachandran outliers	138981	1574 (3.20-3.16)
Sidechain outliers	138945	1573 (3.20-3.16)
RSRZ outliers	127900	1423 (3.20-3.16)

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	665	<div> <div>2%</div> <div> <div></div> <div>69%</div> <div>23%</div> <div>• •</div> </div> </div>
1	B	665	<div> <div>4%</div> <div> <div></div> <div>69%</div> <div>23%</div> <div>5% •</div> </div> </div>
2	D	39	<div> <div>5%</div> <div> <div></div> <div>26%</div> <div>8%</div> <div>•</div> <div>64%</div> </div> </div>
2	E	39	<div> <div>10%</div> <div> <div></div> <div>18%</div> <div>5%</div> <div>5%</div> <div>•</div> <div>69%</div> </div> </div>

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 10606 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 Serine/threonine-protein kinase TBK1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	636	Total	C	N	O	S	0	1	0
			5137	3265	892	955	25			
1	B	643	Total	C	N	O	S	0	0	0
			5193	3299	901	967	26			

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-7	GLY	-	expression tag	UNP Q9WUN2
A	-6	SER	-	expression tag	UNP Q9WUN2
A	-5	PRO	-	expression tag	UNP Q9WUN2
A	-4	GLY	-	expression tag	UNP Q9WUN2
A	-3	LEU	-	expression tag	UNP Q9WUN2
A	-2	ASP	-	expression tag	UNP Q9WUN2
A	-1	GLY	-	expression tag	UNP Q9WUN2
A	0	ILE	-	expression tag	UNP Q9WUN2
A	1	CYS	-	expression tag	UNP Q9WUN2
A	172	ALA	SER	engineered mutation	UNP Q9WUN2
B	-7	GLY	-	expression tag	UNP Q9WUN2
B	-6	SER	-	expression tag	UNP Q9WUN2
B	-5	PRO	-	expression tag	UNP Q9WUN2
B	-4	GLY	-	expression tag	UNP Q9WUN2
B	-3	LEU	-	expression tag	UNP Q9WUN2
B	-2	ASP	-	expression tag	UNP Q9WUN2
B	-1	GLY	-	expression tag	UNP Q9WUN2
B	0	ILE	-	expression tag	UNP Q9WUN2
B	1	CYS	-	expression tag	UNP Q9WUN2
B	172	ALA	SER	engineered mutation	UNP Q9WUN2

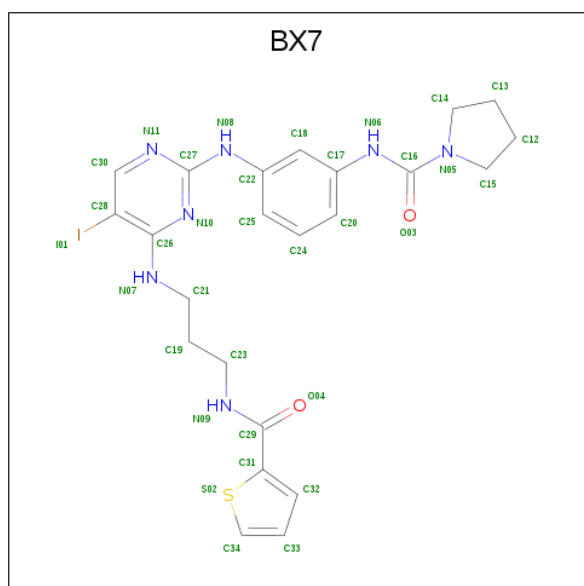
- Molecule 2 is a protein called Stimulator of interferon genes protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	D	14	Total	C	N	O	S	0	0	0
			109	69	18	21	1			
2	E	12	Total	C	N	O	S	0	0	0
			99	64	16	18	1			

There are 4 discrepancies between the modelled and reference sequences:

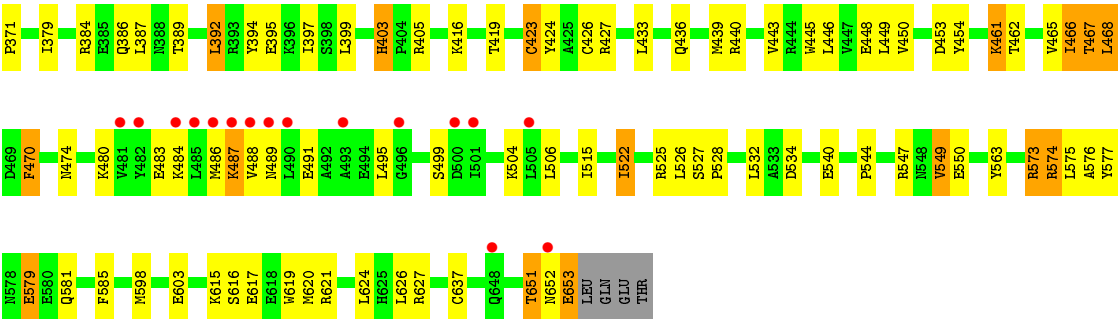
Chain	Residue	Modelled	Actual	Comment	Reference
D	341	SER	-	expression tag	UNP Q86WV6
D	343	TRP	VAL	engineered mutation	UNP Q86WV6
E	341	SER	-	expression tag	UNP Q86WV6
E	343	TRP	VAL	engineered mutation	UNP Q86WV6

- Molecule 3 is N-(3-{[5-iodo-4-({3-[(thiophen-2-ylcarbonyl)amino]propyl}amino)pyrimidin-2-yl]amino}phenyl)pyrrolidine-1-carboxamide (three-letter code: BX7) (formula:  $C_{23}H_{26}IN_7O_2S$ ).

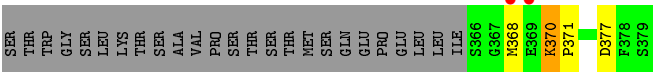


Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
3	A	1	Total	C	I	N	O	S	0	0
			34	23	1	7	2	1		
3	B	1	Total	C	I	N	O	S	0	0
			34	23	1	7	2	1		

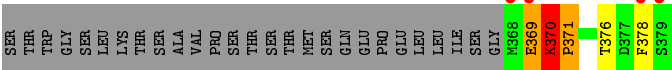




• Molecule 2: Stimulator of interferon genes protein



• Molecule 2: Stimulator of interferon genes protein



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 65 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	249.51Å 249.51Å 243.78Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	81.67 – 3.17 81.67 – 3.17	Depositor EDS
% Data completeness (in resolution range)	99.9 (81.67-3.17) 99.9 (81.67-3.17)	Depositor EDS
$R_{merge}$	0.18	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.38 (at 3.19Å)	Xtriage
Refinement program	PHENIX (1.13_2998: ???)	Depositor
R, $R_{free}$	0.213 , 0.231 0.213 , 0.231	Depositor DCC
$R_{free}$ test set	3720 reflections (4.90%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	95.9	Xtriage
Anisotropy	0.130	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 62.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.51$ , $\langle L^2 \rangle = 0.35$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	10606	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	108.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.51% 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: BX7

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	0.62	2/5243 (0.0%)	0.65	2/7078 (0.0%)
1	B	0.54	1/5300 (0.0%)	0.59	0/7154
2	D	0.70	0/111	0.76	0/148
2	E	0.59	0/101	0.71	0/135
All	All	0.58	3/10755 (0.0%)	0.62	2/14515 (0.0%)

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

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	423	CYS	CB-SG	-6.78	1.70	1.82
1	A	89	CYS	CB-SG	-5.92	1.72	1.81
1	B	426	CYS	CB-SG	-5.56	1.72	1.81

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	427	ARG	NE-CZ-NH1	-5.59	117.50	120.30
1	A	46	LEU	CA-CB-CG	5.21	127.27	115.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	131	ILE	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	5137	0	5130	98	0
1	B	5193	0	5191	101	0
2	D	109	0	109	3	0
2	E	99	0	101	6	0
3	A	34	0	26	2	0
3	B	34	0	26	3	0
All	All	10606	0	10583	201	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 9.

The worst 5 of 201 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:450:VAL:HG22	1:A:627:ARG:HD3	1.70	0.73
1:A:332:ALA:HB1	1:A:361:LEU:HD13	1.73	0.71
1:B:573:ARG:O	1:B:574:ARG:HD2	1.92	0.69
1:B:576:ALA:HB3	1:B:579:GLU:HG2	1.74	0.68
1:A:47:ARG:NH2	1:A:55:GLU:OE1	2.29	0.66

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	631/665 (95%)	588 (93%)	40 (6%)	3 (0%)	29	66
1	B	639/665 (96%)	605 (95%)	29 (4%)	5 (1%)	19	56
2	D	12/39 (31%)	7 (58%)	4 (33%)	1 (8%)	1	4
2	E	10/39 (26%)	6 (60%)	1 (10%)	3 (30%)	0	0
All	All	1292/1408 (92%)	1206 (93%)	74 (6%)	12 (1%)	17	54

5 of 12 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	D	370	LYS
1	A	494	GLU
1	B	196	LYS
2	E	369	GLU
1	A	289	GLN

### 5.3.2 Protein sidechains ⓘ

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	565/590 (96%)	497 (88%)	68 (12%)	5	21
1	B	572/590 (97%)	506 (88%)	66 (12%)	5	23
2	D	13/36 (36%)	12 (92%)	1 (8%)	13	42
2	E	12/36 (33%)	10 (83%)	2 (17%)	2	9
All	All	1162/1252 (93%)	1025 (88%)	137 (12%)	5	22

5 of 137 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	549	VAL
1	B	59	LEU
1	B	574	ARG
1	A	575	LEU

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type
1	B	1	CYS

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	A	368	GLN
1	B	330	ASN
1	A	539	GLN
1	A	41	ASN
1	B	81	HIS

### 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](#)

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	BX7	B	701	-	35,37,37	4.96	20 (57%)	42,49,49	2.99	18 (42%)
3	BX7	A	701	-	35,37,37	4.93	20 (57%)	42,49,49	3.22	16 (38%)

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	BX7	B	701	-	-	7/22/31/31	0/4/4/4
3	BX7	A	701	-	-	3/22/31/31	0/4/4/4

The worst 5 of 40 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	701	BX7	C31-S02	-13.56	1.55	1.72
3	A	701	BX7	C31-S02	-13.16	1.56	1.72
3	B	701	BX7	C26-N07	11.65	1.52	1.34
3	A	701	BX7	C26-N07	10.97	1.51	1.34
3	A	701	BX7	C27-N08	9.25	1.55	1.36

The worst 5 of 34 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	701	BX7	N11-C27-N10	-10.36	116.74	126.55
3	B	701	BX7	N11-C27-N10	-9.18	117.85	126.55
3	A	701	BX7	C33-C34-S02	-7.23	107.12	112.98
3	A	701	BX7	C25-C22-C18	-7.02	111.32	119.65
3	B	701	BX7	C25-C22-C18	-6.44	112.01	119.65

There are no chirality outliers.

5 of 10 torsion outliers are listed below:

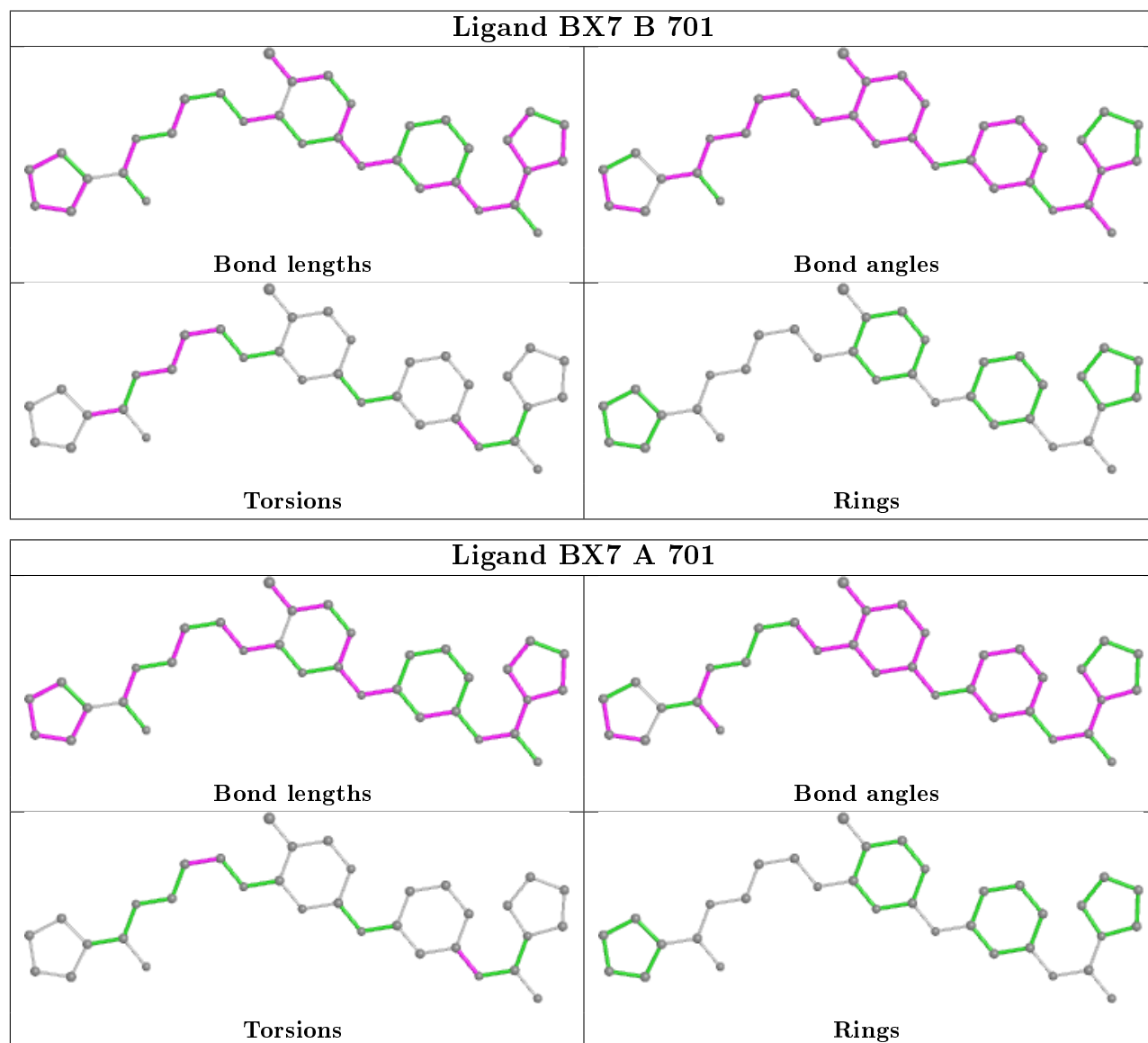
Mol	Chain	Res	Type	Atoms
3	B	701	BX7	O04-C29-C31-C32
3	B	701	BX7	N09-C29-C31-C32
3	B	701	BX7	C21-C19-C23-N09
3	B	701	BX7	C20-C17-N06-C16
3	B	701	BX7	C18-C17-N06-C16

There are no ring outliers.

2 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	701	BX7	3	0
3	A	701	BX7	2	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	A	636/665 (95%)	0.10	16 (2%) 57 43	60, 90, 161, 217	0
1	B	643/665 (96%)	0.23	26 (4%) 38 24	64, 108, 190, 256	0
2	D	14/39 (35%)	0.74	2 (14%) 2 1	80, 104, 142, 143	0
2	E	12/39 (30%)	1.34	4 (33%) 0 0	88, 112, 150, 158	0
All	All	1305/1408 (92%)	0.18	48 (3%) 41 26	60, 99, 176, 256	0

The worst 5 of 48 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	482	TYR	6.5
1	B	486	MET	5.7
1	B	481	VAL	5.4
2	E	379	SER	5.3
1	A	478	THR	4.7

### 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](#)

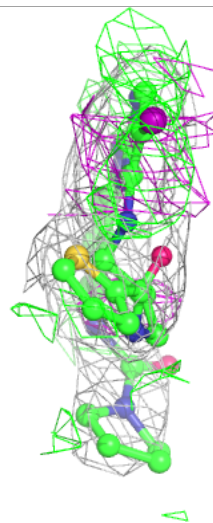
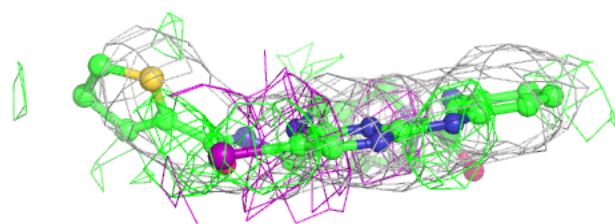
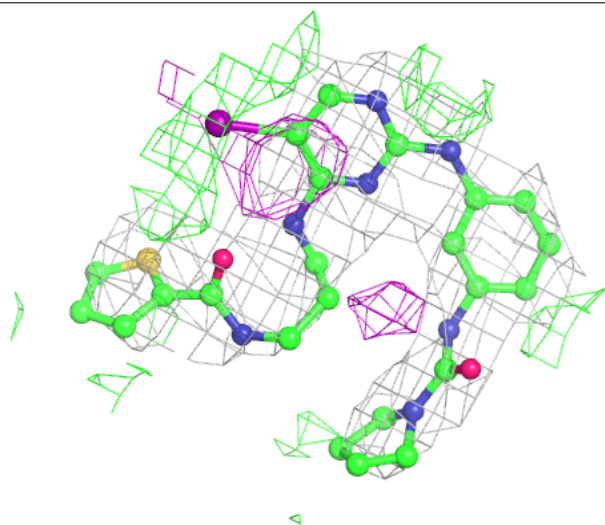
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 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
3	BX7	B	701	34/34	0.93	0.31	40,106,142,152	0
3	BX7	A	701	34/34	0.93	0.27	34,75,122,129	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.

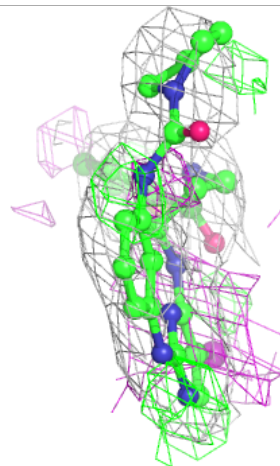
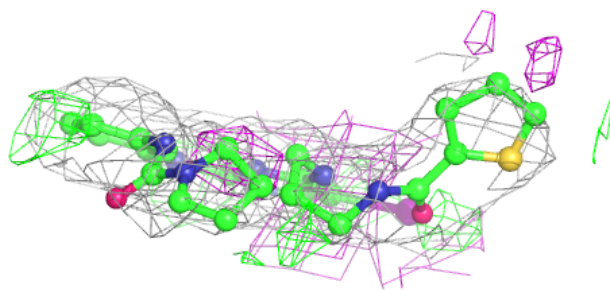
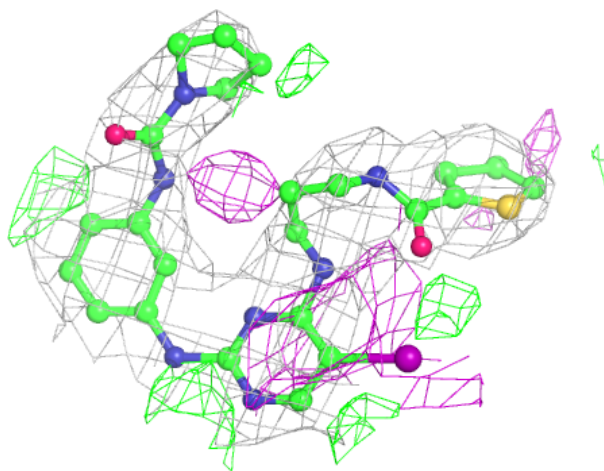
**Electron density around BX7 B 701:**

2mF<sub>o</sub>-DF<sub>c</sub> (at 0.7 rmsd) in gray  
mF<sub>o</sub>-DF<sub>c</sub> (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around BX7 A 701:**

$2mF_o-DF_c$  (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.