



# wwPDB X-ray Structure Validation Summary Report

Jan 4, 2024 – 10:48 pm GMT

PDB ID : 5A15  
Title : Crystal structure of the BTB domain of human KCTD16  
Authors : Pinkas, D.M.; Sanvitale, C.E.; Solcan, N.; Goubin, S.; Canning, P.; Dixon Clarke, S.E.; Talon, R.; Wiggers, H.J.; Fitzpatrick, F.; Tallant, C.; Kopec, J.; Chalk, R.; Douth, J.; Krojer, T.; Burgess-Brown, N.A.; von Delft, F.; Arrowsmith, C.H.; Edwards, A.M.; Bountra, C.; Bullock, A.  
Deposited on : 2015-04-28  
Resolution : 2.76 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  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
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) : 2.36

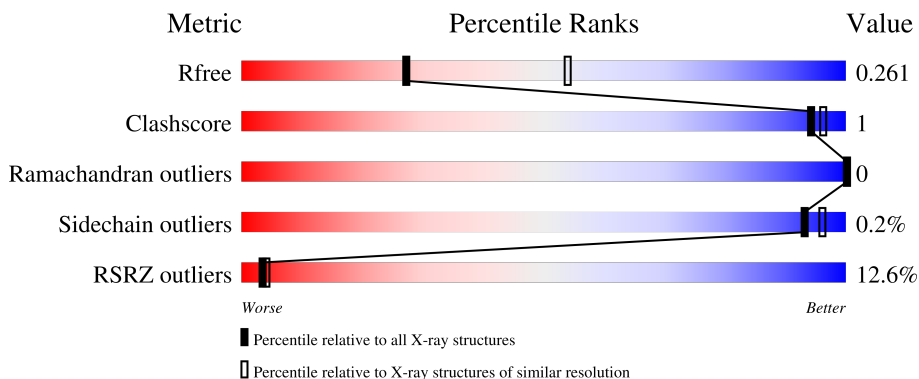
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.76 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	1235 (2.78-2.74)
Clashscore	141614	1277 (2.78-2.74)
Ramachandran outliers	138981	1257 (2.78-2.74)
Sidechain outliers	138945	1257 (2.78-2.74)
RSRZ outliers	127900	1207 (2.78-2.74)

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	120	
1	B	120	
1	C	120	
1	D	120	
1	E	120	

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Mol	Chain	Length	Quality of chain
1	F	120	<p>24% 76% 7% 21%</p>
1	G	120	<p>11% 72% 7% 21%</p>
1	H	120	<p>7% 75% 7% 21%</p>
1	I	120	<p>4% 77% 7% 21%</p>
1	J	120	<p>18% 77% 7% 21%</p>
1	K	120	<p>21% 76% 7% 21%</p>
1	L	120	<p>10% 77% 7% 21%</p>
1	M	120	<p>3% 76% 7% 21%</p>
1	N	120	<p>11% 75% 7% 21%</p>
1	O	120	<p>21% 78% 7% 21%</p>

## 2 Entry composition [i](#)

There is only 1 type of molecule in this entry. The entry contains 23373 atoms, of which 11563 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 BTB/POZ DOMAIN-CONTAINING PROTEIN KCTD16.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	95	1575	522	783	134	135	1	0	0	0
1	B	95	1590	525	794	135	135	1	0	0	0
1	C	95	1575	522	783	134	135	1	0	0	0
1	D	95	1591	526	794	135	135	1	0	0	0
1	E	95	1532	514	754	130	133	1	0	0	0
1	F	95	1546	516	763	131	135	1	0	0	0
1	G	95	1578	522	785	135	135	1	0	0	0
1	H	95	1576	523	783	134	135	1	0	0	0
1	I	95	1591	526	794	135	135	1	0	0	0
1	J	95	1538	515	757	132	133	1	0	0	0
1	K	95	1499	507	728	128	135	1	0	0	0
1	L	95	1549	517	763	133	135	1	0	0	0
1	M	95	1549	517	763	133	135	1	0	0	0
1	N	95	1546	517	761	132	135	1	0	0	0
1	O	95	1538	514	758	132	133	1	0	0	0

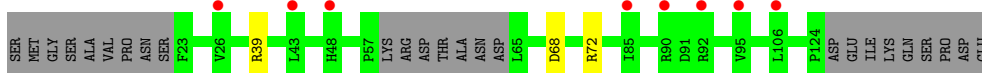
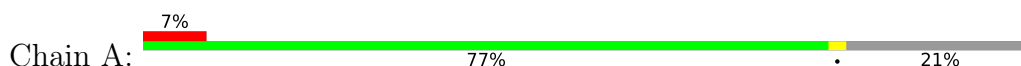
There are 30 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	14	SER	-	expression tag	UNP Q68DU8
A	15	MET	-	expression tag	UNP Q68DU8
B	14	SER	-	expression tag	UNP Q68DU8
B	15	MET	-	expression tag	UNP Q68DU8
C	14	SER	-	expression tag	UNP Q68DU8
C	15	MET	-	expression tag	UNP Q68DU8
D	14	SER	-	expression tag	UNP Q68DU8
D	15	MET	-	expression tag	UNP Q68DU8
E	14	SER	-	expression tag	UNP Q68DU8
E	15	MET	-	expression tag	UNP Q68DU8
F	14	SER	-	expression tag	UNP Q68DU8
F	15	MET	-	expression tag	UNP Q68DU8
G	14	SER	-	expression tag	UNP Q68DU8
G	15	MET	-	expression tag	UNP Q68DU8
H	14	SER	-	expression tag	UNP Q68DU8
H	15	MET	-	expression tag	UNP Q68DU8
I	14	SER	-	expression tag	UNP Q68DU8
I	15	MET	-	expression tag	UNP Q68DU8
J	14	SER	-	expression tag	UNP Q68DU8
J	15	MET	-	expression tag	UNP Q68DU8
K	14	SER	-	expression tag	UNP Q68DU8
K	15	MET	-	expression tag	UNP Q68DU8
L	14	SER	-	expression tag	UNP Q68DU8
L	15	MET	-	expression tag	UNP Q68DU8
M	14	SER	-	expression tag	UNP Q68DU8
M	15	MET	-	expression tag	UNP Q68DU8
N	14	SER	-	expression tag	UNP Q68DU8
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O	14	SER	-	expression tag	UNP Q68DU8
O	15	MET	-	expression tag	UNP Q68DU8

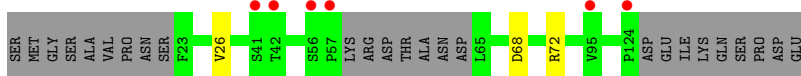
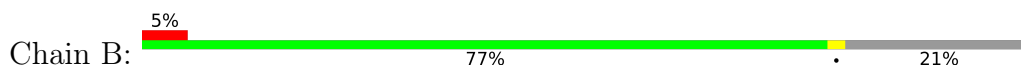
### 3 Residue-property plots [i](#)

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.

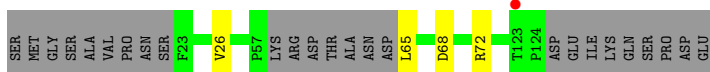
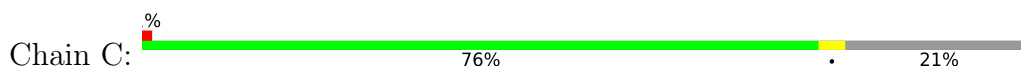
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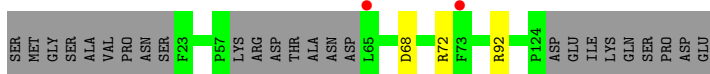
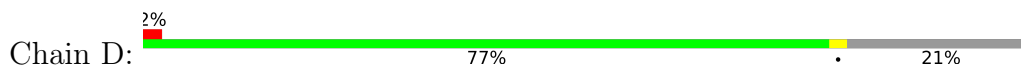
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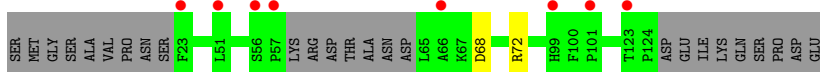
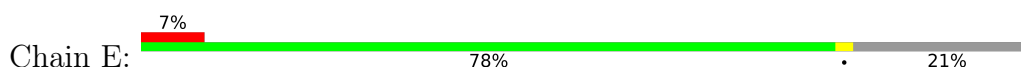
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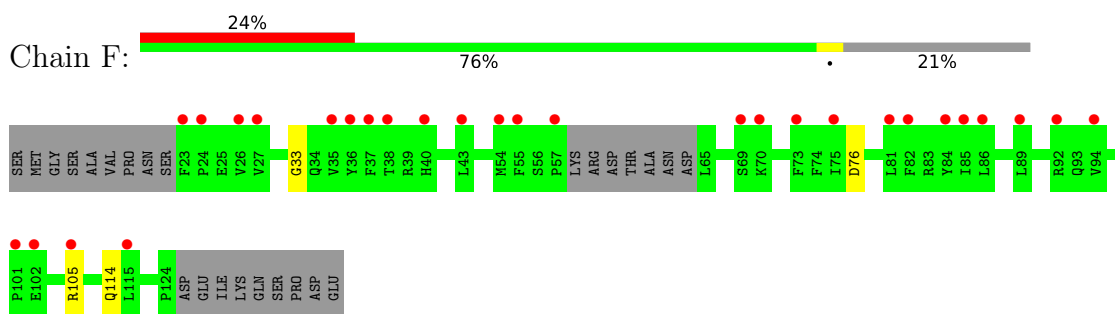
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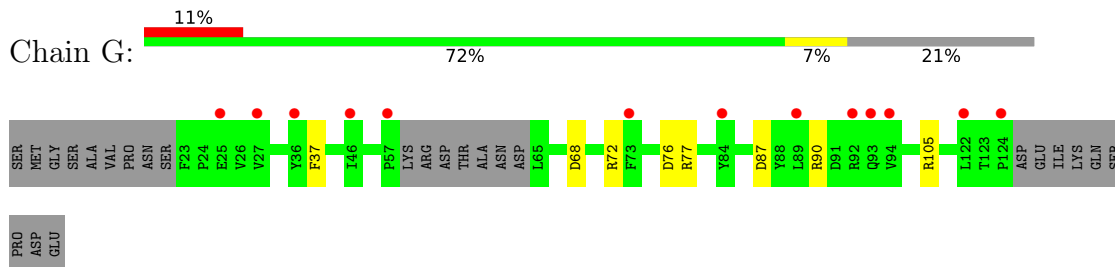
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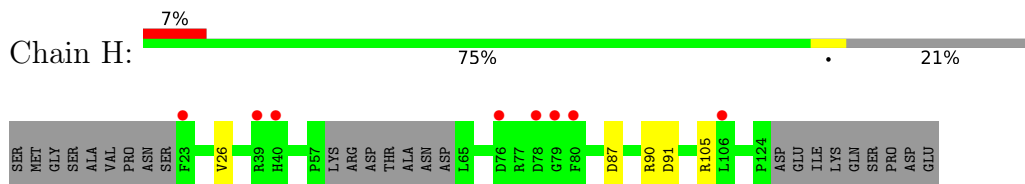
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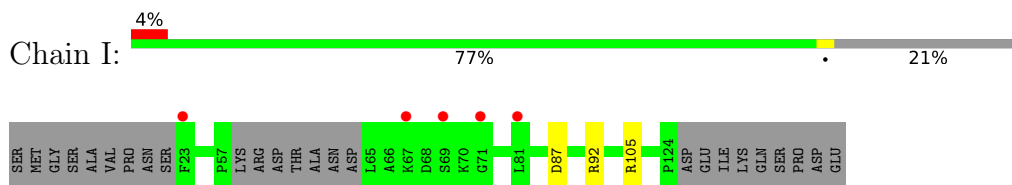
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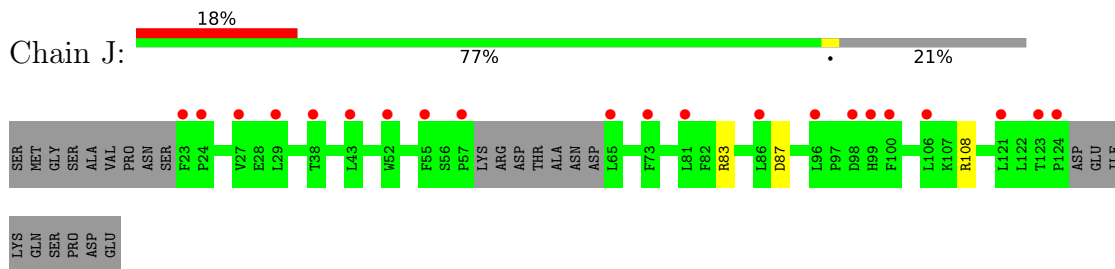
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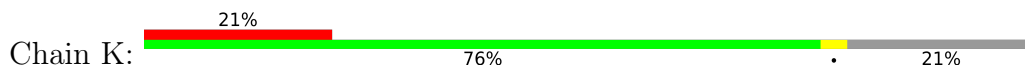
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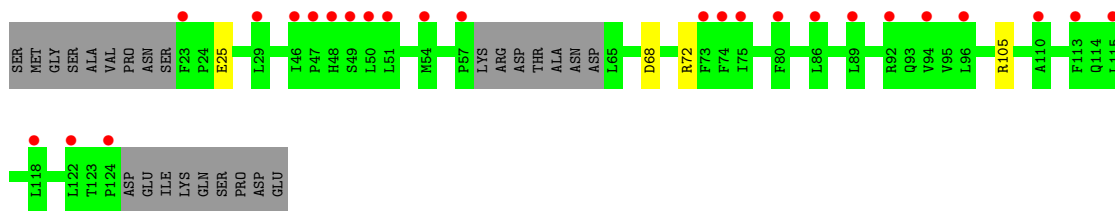


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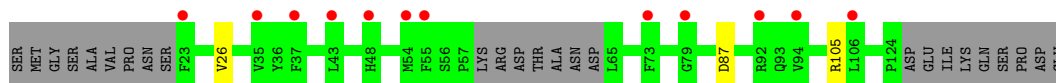
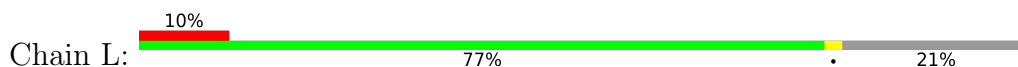


- Molecule 1: BTB/POZ DOMAIN-CONTAINING PROTEIN KCTD16

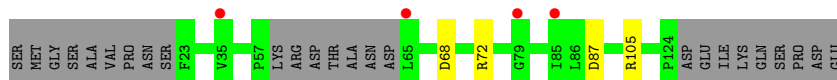
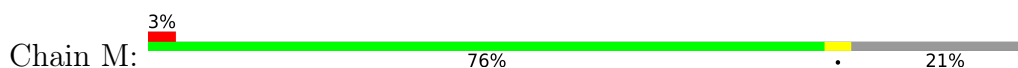




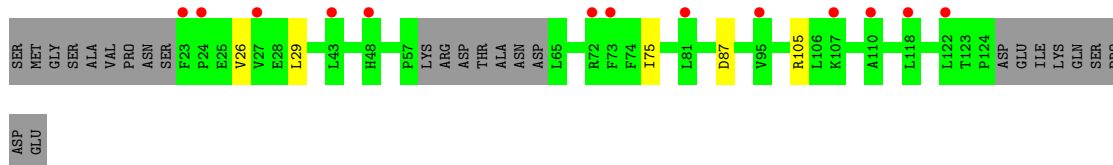
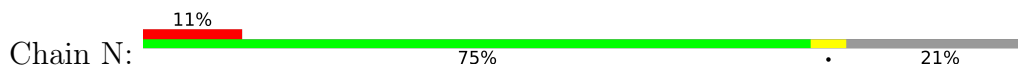
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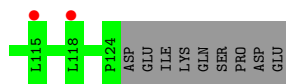
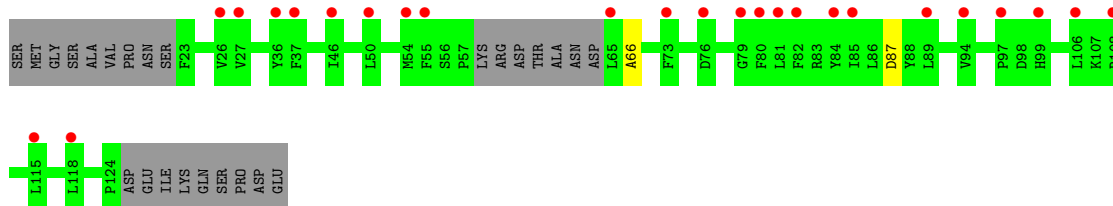
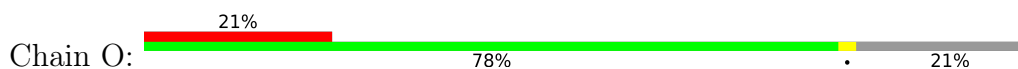
- Molecule 1: BTB/POZ DOMAIN-CONTAINING PROTEIN KCTD16



- Molecule 1: BTB/POZ DOMAIN-CONTAINING PROTEIN KCTD16



- Molecule 1: BTB/POZ DOMAIN-CONTAINING PROTEIN KCTD16





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	57.79Å 69.37Å 134.24Å 102.45° 95.72° 90.71°	Depositor
Resolution (Å)	34.65 – 2.76 36.55 – 2.76	Depositor EDS
% Data completeness (in resolution range)	97.9 (34.65-2.76) 97.9 (36.55-2.76)	Depositor EDS
$R_{merge}$	0.05	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.32 (at 2.77Å)	Xtrriage
Refinement program	PHENIX (PHENIX.REFINE)	Depositor
R, $R_{free}$	0.216 , 0.259 0.223 , 0.261	Depositor DCC
$R_{free}$ test set	2456 reflections (4.82%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	82.1	Xtrriage
Anisotropy	0.733	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 71.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.018 for -h,k,-k-l	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	23373	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	115.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.16% 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](#)

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	0.25	0/815	0.46	0/1103
1	B	0.25	0/819	0.43	0/1107
1	C	0.25	0/815	0.42	0/1103
1	D	0.24	0/820	0.42	0/1108
1	E	0.23	0/801	0.42	0/1086
1	F	0.23	0/806	0.39	0/1092
1	G	0.24	0/816	0.41	0/1103
1	H	0.24	0/816	0.41	0/1104
1	I	0.24	0/820	0.42	0/1108
1	J	0.23	0/804	0.39	0/1091
1	K	0.23	0/794	0.39	0/1080
1	L	0.23	0/809	0.39	0/1096
1	M	0.23	0/809	0.40	0/1096
1	N	0.23	0/808	0.39	0/1096
1	O	0.24	0/803	0.42	0/1090
All	All	0.24	0/12155	0.41	0/16463

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	O	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	O	66	ALA	Peptide

## 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	792	783	784	2	0
1	B	796	794	795	4	0
1	C	792	783	784	4	0
1	D	797	794	797	2	0
1	E	778	754	755	1	0
1	F	783	763	764	3	1
1	G	793	785	786	8	0
1	H	793	783	786	5	0
1	I	797	794	797	4	0
1	J	781	757	760	2	0
1	K	771	728	731	3	1
1	L	786	763	766	3	0
1	M	786	763	766	4	0
1	N	785	761	764	4	0
1	O	780	758	758	1	0
All	All	11810	11563	11593	30	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 1.

The worst 5 of 30 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:I:105:ARG:NH2	1:J:87:ASP:OD2	2.13	0.82
1:K:105:ARG:NH2	1:L:87:ASP:OD2	2.17	0.77
1:N:105:ARG:NH2	1:O:87:ASP:OD2	2.18	0.76
1:F:105:ARG:NH2	1:G:87:ASP:OD2	2.18	0.76
1:L:105:ARG:NH2	1:M:87:ASP:OD2	2.20	0.73

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)
1:F:114:GLN:HE22	1:K:25:GLU:OE1[1_554]	1.58	0.02

## 5.3 Torsion angles

### 5.3.1 Protein backbone

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	91/120 (76%)	90 (99%)	1 (1%)	0	100	100
1	B	91/120 (76%)	90 (99%)	1 (1%)	0	100	100
1	C	91/120 (76%)	90 (99%)	1 (1%)	0	100	100
1	D	91/120 (76%)	90 (99%)	1 (1%)	0	100	100
1	E	91/120 (76%)	88 (97%)	3 (3%)	0	100	100
1	F	91/120 (76%)	89 (98%)	2 (2%)	0	100	100
1	G	91/120 (76%)	90 (99%)	1 (1%)	0	100	100
1	H	91/120 (76%)	90 (99%)	1 (1%)	0	100	100
1	I	91/120 (76%)	89 (98%)	2 (2%)	0	100	100
1	J	91/120 (76%)	89 (98%)	2 (2%)	0	100	100
1	K	91/120 (76%)	90 (99%)	1 (1%)	0	100	100
1	L	91/120 (76%)	90 (99%)	1 (1%)	0	100	100
1	M	91/120 (76%)	90 (99%)	1 (1%)	0	100	100
1	N	91/120 (76%)	89 (98%)	2 (2%)	0	100	100
1	O	91/120 (76%)	87 (96%)	4 (4%)	0	100	100
All	All	1365/1800 (76%)	1341 (98%)	24 (2%)	0	100	100

There are no Ramachandran outliers to report.

### 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	86/110 (78%)	85 (99%)	1 (1%)	71	82
1	B	87/110 (79%)	87 (100%)	0	100	100
1	C	86/110 (78%)	86 (100%)	0	100	100
1	D	87/110 (79%)	87 (100%)	0	100	100
1	E	82/110 (74%)	82 (100%)	0	100	100
1	F	84/110 (76%)	84 (100%)	0	100	100
1	G	86/110 (78%)	86 (100%)	0	100	100
1	H	86/110 (78%)	86 (100%)	0	100	100
1	I	87/110 (79%)	87 (100%)	0	100	100
1	J	83/110 (76%)	82 (99%)	1 (1%)	71	82
1	K	81/110 (74%)	81 (100%)	0	100	100
1	L	84/110 (76%)	84 (100%)	0	100	100
1	M	84/110 (76%)	84 (100%)	0	100	100
1	N	84/110 (76%)	84 (100%)	0	100	100
1	O	83/110 (76%)	83 (100%)	0	100	100
All	All	1270/1650 (77%)	1268 (100%)	2 (0%)	93	96

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	39	ARG
1	J	108	ARG

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 [i](#)

There are no ligands in this entry.

## 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	95/120 (79%)	0.79	8 (8%) 11 13	71, 99, 130, 151	0
1	B	95/120 (79%)	0.73	6 (6%) 20 24	63, 76, 107, 133	0
1	C	95/120 (79%)	0.38	1 (1%) 80 86	59, 74, 98, 130	0
1	D	95/120 (79%)	0.59	2 (2%) 63 72	59, 74, 101, 128	0
1	E	95/120 (79%)	0.45	8 (8%) 11 13	66, 90, 127, 147	0
1	F	95/120 (79%)	1.35	29 (30%) 0 0	109, 139, 155, 159	0
1	G	95/120 (79%)	1.11	13 (13%) 3 3	90, 112, 129, 151	0
1	H	95/120 (79%)	0.47	8 (8%) 11 13	72, 93, 118, 136	0
1	I	95/120 (79%)	0.70	5 (5%) 26 31	68, 82, 111, 132	0
1	J	95/120 (79%)	1.15	21 (22%) 0 0	87, 122, 149, 163	0
1	K	95/120 (79%)	1.10	25 (26%) 0 0	102, 138, 157, 163	0
1	L	95/120 (79%)	0.83	12 (12%) 3 4	100, 122, 148, 162	0
1	M	95/120 (79%)	0.65	4 (4%) 36 43	80, 102, 126, 147	0
1	N	95/120 (79%)	0.69	13 (13%) 3 3	90, 120, 147, 162	0
1	O	95/120 (79%)	1.10	25 (26%) 0 0	107, 131, 148, 167	0
All	All	1425/1800 (79%)	0.81	180 (12%) 3 4	59, 106, 148, 167	0

The worst 5 of 180 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	65	LEU	11.5
1	J	23	PHE	8.5
1	F	27	VAL	8.2
1	J	65	LEU	6.8
1	F	115	LEU	5.9

## 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](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.