



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 24, 2023 – 11:37 AM EDT

PDB ID : 5U6K  
Title : Crystal structure of TopBP1 BRCT4/5 in complex with a BLM phosphopeptide  
Authors : Glover, J.N.M.; Sun, L.; Edwards, R.A.  
Deposited on : 2016-12-08  
Resolution : 2.60 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>.

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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 : 2.35.1  
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) : 2.35.1

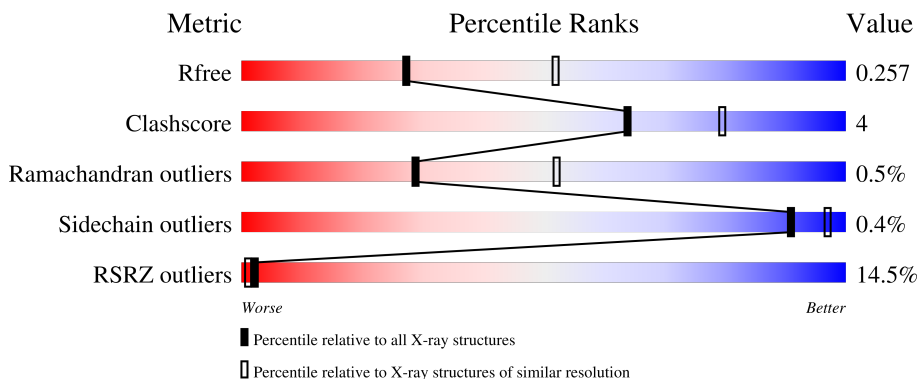
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.60 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	3163 (2.60-2.60)
Clashscore	141614	3518 (2.60-2.60)
Ramachandran outliers	138981	3455 (2.60-2.60)
Sidechain outliers	138945	3455 (2.60-2.60)
RSRZ outliers	127900	3104 (2.60-2.60)

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	200	 2% 84% 12% 5%
1	B	200	 2% 87% 8% 5%
1	C	200	 2% 82% 12% 5%
1	D	200	 2% 86% 10% 5%
1	E	200	 8% 86% 8% 5%

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Mol	Chain	Length	Quality of chain
1	F	200	<p>25% 86% 8%</p>
1	G	200	<p>26% 85% 10%</p>
1	H	200	<p>40% 85% 10%</p>
2	L	13	<p>23% 23% 15% 8% 54%</p>
2	M	13	<p>31% 31% 15% 54%</p>
2	N	13	<p>23% 23% 8% 8% 62%</p>
2	O	13	<p>15% 62% 8% 8% 23%</p>

## 2 Entry composition i

There are 2 unique types of molecules in this entry. The entry contains 11899 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 DNA topoisomerase 2-binding protein 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	190	1455	931	245	272	7	0	0	0
1	B	190	1455	931	245	272	7	0	0	0
1	C	190	1455	931	245	272	7	0	0	0
1	D	190	1455	931	245	272	7	0	0	0
1	E	191	1464	936	246	275	7	0	0	0
1	F	191	1464	936	246	275	7	0	0	0
1	G	191	1464	936	246	275	7	0	0	0
1	H	191	1464	936	246	275	7	0	0	0

There are 48 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	547	GLY	-	expression tag	UNP Q6ZQF0
A	548	PRO	-	expression tag	UNP Q6ZQF0
A	549	LEU	-	expression tag	UNP Q6ZQF0
A	550	GLY	-	expression tag	UNP Q6ZQF0
A	551	SER	-	expression tag	UNP Q6ZQF0
A	552	MET	-	expression tag	UNP Q6ZQF0
B	547	GLY	-	expression tag	UNP Q6ZQF0
B	548	PRO	-	expression tag	UNP Q6ZQF0
B	549	LEU	-	expression tag	UNP Q6ZQF0
B	550	GLY	-	expression tag	UNP Q6ZQF0
B	551	SER	-	expression tag	UNP Q6ZQF0
B	552	MET	-	expression tag	UNP Q6ZQF0
C	547	GLY	-	expression tag	UNP Q6ZQF0

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Chain	Residue	Modelled	Actual	Comment	Reference
C	548	PRO	-	expression tag	UNP Q6ZQF0
C	549	LEU	-	expression tag	UNP Q6ZQF0
C	550	GLY	-	expression tag	UNP Q6ZQF0
C	551	SER	-	expression tag	UNP Q6ZQF0
C	552	MET	-	expression tag	UNP Q6ZQF0
D	547	GLY	-	expression tag	UNP Q6ZQF0
D	548	PRO	-	expression tag	UNP Q6ZQF0
D	549	LEU	-	expression tag	UNP Q6ZQF0
D	550	GLY	-	expression tag	UNP Q6ZQF0
D	551	SER	-	expression tag	UNP Q6ZQF0
D	552	MET	-	expression tag	UNP Q6ZQF0
E	547	GLY	-	expression tag	UNP Q6ZQF0
E	548	PRO	-	expression tag	UNP Q6ZQF0
E	549	LEU	-	expression tag	UNP Q6ZQF0
E	550	GLY	-	expression tag	UNP Q6ZQF0
E	551	SER	-	expression tag	UNP Q6ZQF0
E	552	MET	-	expression tag	UNP Q6ZQF0
F	547	GLY	-	expression tag	UNP Q6ZQF0
F	548	PRO	-	expression tag	UNP Q6ZQF0
F	549	LEU	-	expression tag	UNP Q6ZQF0
F	550	GLY	-	expression tag	UNP Q6ZQF0
F	551	SER	-	expression tag	UNP Q6ZQF0
F	552	MET	-	expression tag	UNP Q6ZQF0
G	547	GLY	-	expression tag	UNP Q6ZQF0
G	548	PRO	-	expression tag	UNP Q6ZQF0
G	549	LEU	-	expression tag	UNP Q6ZQF0
G	550	GLY	-	expression tag	UNP Q6ZQF0
G	551	SER	-	expression tag	UNP Q6ZQF0
G	552	MET	-	expression tag	UNP Q6ZQF0
H	547	GLY	-	expression tag	UNP Q6ZQF0
H	548	PRO	-	expression tag	UNP Q6ZQF0
H	549	LEU	-	expression tag	UNP Q6ZQF0
H	550	GLY	-	expression tag	UNP Q6ZQF0
H	551	SER	-	expression tag	UNP Q6ZQF0
H	552	MET	-	expression tag	UNP Q6ZQF0

- Molecule 2 is a protein called Bloom Syndrome recQ helicase like protein (BLM).

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace	
2	L	6	Total	C	N	O	P	0	0	0
			49	32	6	10	1			
2	M	6	Total	C	N	O	P	0	0	0
			49	32	6	10	1			

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
2	N	5	42	27	5	9	1	0	0	0
2	O	10	83	54	10	18	1	0	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: DNA topoisomerase 2-binding protein 1

Chain A: 




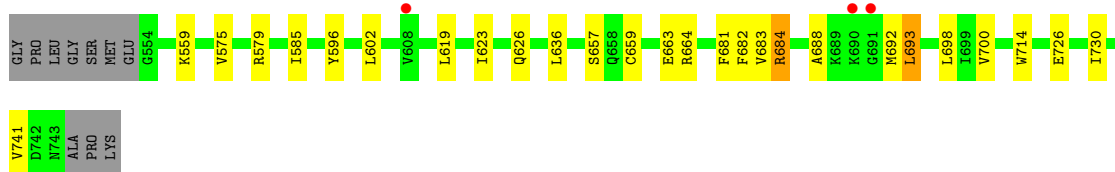
- Molecule 1: DNA topoisomerase 2-binding protein 1

Chain B: 




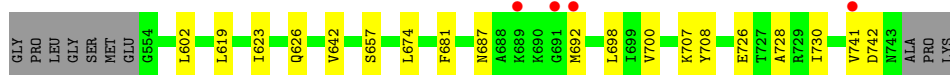
- Molecule 1: DNA topoisomerase 2-binding protein 1

Chain C: 




- Molecule 1: DNA topoisomerase 2-binding protein 1

Chain D: 



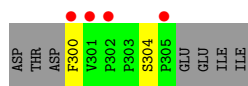
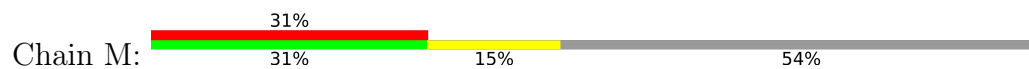
- Molecule 1: DNA topoisomerase 2-binding protein 1

Chain E: 





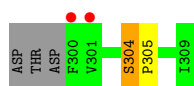
- Molecule 2: Bloom Sydrome recQ helicase like protein (BLM)



- Molecule 2: Bloom Sydrome recQ helicase like protein (BLM)



- Molecule 2: Bloom Sydrome recQ helicase like protein (BLM)



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	98.16Å 96.82Å 127.05Å 90.00° 94.25° 90.00°	Depositor
Resolution (Å)	47.87 – 2.60 48.41 – 2.60	Depositor EDS
% Data completeness (in resolution range)	97.9 (47.87-2.60) 98.3 (48.41-2.60)	Depositor EDS
$R_{merge}$	0.13	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.72 (at 2.61Å)	Xtrriage
Refinement program	PHENIX	Depositor
R, $R_{free}$	0.219 , 0.256 0.220 , 0.257	Depositor DCC
$R_{free}$ test set	3646 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	54.9	Xtrriage
Anisotropy	0.965	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 62.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.51$ , $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	11899	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	112.0	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 46.08 % 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 1.2054e-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: SEP

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	0.29	0/1483	0.47	0/2017
1	B	0.27	0/1483	0.44	0/2017
1	C	0.29	0/1483	0.46	0/2017
1	D	0.27	0/1483	0.44	0/2017
1	E	0.27	0/1492	0.44	0/2029
1	F	0.26	0/1492	0.43	0/2029
1	G	0.27	0/1492	0.43	0/2029
1	H	0.25	0/1492	0.42	0/2029
2	L	0.30	0/41	0.30	0/55
2	M	0.31	0/41	0.30	0/55
2	N	0.31	0/34	0.29	0/47
2	O	0.27	0/75	0.38	0/101
All	All	0.27	0/12091	0.44	0/16442

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	F	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	F	588	LEU	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	1455	0	1480	16	0
1	B	1455	0	1480	11	0
1	C	1455	0	1480	18	0
1	D	1455	0	1480	12	0
1	E	1464	0	1486	13	0
1	F	1464	0	1486	10	0
1	G	1464	0	1486	13	0
1	H	1464	0	1486	11	0
2	L	49	0	42	3	0
2	M	49	0	42	1	0
2	N	42	0	35	2	0
2	O	83	0	76	3	0
All	All	11899	0	12059	100	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 4.

All (100) 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:C:657:SER:HB3	1:C:700:VAL:HG12	1.55	0.89
1:D:657:SER:HB3	1:D:700:VAL:HG12	1.57	0.86
1:C:659:CYS:O	1:C:664:ARG:NH1	2.08	0.86
1:E:713:LYS:HZ3	2:O:305:PRO:HD2	1.41	0.83
1:B:657:SER:HB3	1:B:700:VAL:HG12	1.58	0.83
1:A:657:SER:HB3	1:A:700:VAL:HG12	1.60	0.82
1:G:680:GLU:OE2	1:G:707:LYS:NZ	2.16	0.76
1:F:663:GLU:OE2	1:F:701:LYS:NZ	2.22	0.70
1:C:683:VAL:HG23	2:N:300:PHE:HB3	1.75	0.69
1:D:657:SER:HB2	1:D:707:LYS:HD2	1.80	0.64
1:E:657:SER:HB3	1:E:700:VAL:HG13	1.78	0.64
1:F:689:LYS:HD3	1:F:691:GLY:H	1.63	0.63
1:E:708:TYR:OH	1:E:742:ASP:OD1	2.14	0.62
1:H:597:ALA:HB2	1:H:610:VAL:HG11	1.80	0.61
1:E:713:LYS:NZ	2:O:305:PRO:HD2	2.13	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:602:LEU:HG	1:E:626:GLN:OE1	2.02	0.60
1:C:602:LEU:HG	1:G:626:GLN:OE1	2.04	0.58
1:G:663:GLU:OE2	1:G:701:LYS:NZ	2.37	0.57
1:E:713:LYS:NZ	2:O:304:SEP:OG	2.37	0.57
1:H:588:LEU:HB3	1:H:589:PRO:HD2	1.89	0.55
1:B:623:ILE:O	1:B:626:GLN:NE2	2.39	0.55
1:D:687:ASN:HD22	1:D:692:MET:HE3	1.71	0.55
1:F:597:ALA:HB2	1:F:610:VAL:HG11	1.90	0.54
1:D:602:LEU:HG	1:H:626:GLN:OE1	2.09	0.53
1:G:657:SER:HB2	1:G:707:LYS:HD2	1.90	0.53
1:C:657:SER:OG	2:N:304:SEP:O1P	2.23	0.52
1:A:619:LEU:O	1:A:623:ILE:HD12	2.09	0.52
1:A:726:GLU:OE2	1:A:730:ILE:HD11	2.10	0.52
1:A:683:VAL:HA	2:L:300:PHE:HA	1.92	0.52
1:H:726:GLU:OE2	1:H:730:ILE:HD11	2.10	0.52
1:H:657:SER:HB2	1:H:707:LYS:HD2	1.92	0.52
1:A:680:GLU:HG2	2:L:303:PRO:HB3	1.91	0.51
1:B:683:VAL:HA	2:M:300:PHE:HA	1.93	0.51
1:E:597:ALA:HB2	1:E:610:VAL:HG11	1.90	0.51
1:C:726:GLU:OE2	1:C:730:ILE:HD11	2.11	0.51
1:G:683:VAL:HA	1:G:714:TRP:CH2	2.46	0.50
1:G:726:GLU:OE2	1:G:730:ILE:HD11	2.12	0.50
1:F:657:SER:HB2	1:F:707:LYS:HD2	1.93	0.50
1:D:674:LEU:HD11	1:D:728:ALA:HB2	1.93	0.50
1:B:726:GLU:OE2	1:B:730:ILE:HD11	2.12	0.50
1:D:642:VAL:HG22	1:D:728:ALA:HB1	1.93	0.50
1:A:708:TYR:OH	1:A:742:ASP:OD1	2.19	0.49
1:B:698:LEU:HG	1:B:700:VAL:HG13	1.94	0.49
1:C:693:LEU:H	1:C:693:LEU:HD12	1.76	0.49
1:C:619:LEU:O	1:C:623:ILE:HD12	2.13	0.49
1:F:617:THR:HG1	1:F:666:SER:HG	1.60	0.48
1:G:636:LEU:HD12	1:G:663:GLU:HG3	1.95	0.48
1:A:642:VAL:HG22	1:A:728:ALA:HB1	1.95	0.47
1:D:726:GLU:OE2	1:D:730:ILE:HD11	2.14	0.47
1:D:708:TYR:OH	1:D:742:ASP:OD1	2.17	0.47
1:E:674:LEU:HD11	1:E:728:ALA:HB2	1.97	0.47
1:C:698:LEU:HG	1:C:700:VAL:HG13	1.96	0.47
1:G:683:VAL:HG12	1:G:684:ARG:HE	1.80	0.47
1:A:698:LEU:HG	1:A:700:VAL:HG13	1.97	0.47
1:E:698:LEU:HG	1:E:700:VAL:HG22	1.97	0.46
1:H:619:LEU:O	1:H:623:ILE:HD12	2.15	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:726:GLU:OE2	1:E:730:ILE:HD11	2.15	0.46
1:C:623:ILE:O	1:C:626:GLN:NE2	2.48	0.46
1:C:636:LEU:HD12	1:C:663:GLU:HG3	1.97	0.46
1:A:657:SER:HB2	1:A:707:LYS:HD2	1.98	0.45
1:C:575:VAL:HG13	1:C:585:ILE:CD1	2.46	0.45
1:D:700:VAL:CG2	1:D:741:VAL:HG21	2.47	0.45
1:C:684:ARG:HG2	1:C:714:TRP:CD2	2.52	0.45
1:A:657:SER:OG	2:L:304:SEP:O3P	2.23	0.45
1:G:597:ALA:HB2	1:G:610:VAL:HG11	1.98	0.45
1:D:698:LEU:HG	1:D:700:VAL:HG13	1.99	0.45
1:B:619:LEU:O	1:B:623:ILE:HD12	2.17	0.45
1:F:683:VAL:HG21	1:F:686:ALA:HB2	1.99	0.44
1:C:682:PHE:CE1	1:C:698:LEU:HB2	2.51	0.44
1:A:650:GLU:HA	1:A:675:GLY:O	2.17	0.44
1:A:682:PHE:CE1	1:A:698:LEU:HB2	2.52	0.44
1:A:718:ALA:O	1:A:741:VAL:HG23	2.18	0.44
1:G:683:VAL:HA	1:G:714:TRP:HH2	1.82	0.44
1:B:657:SER:HB2	1:B:707:LYS:HD2	2.00	0.44
1:B:642:VAL:HG22	1:B:728:ALA:HB1	1.99	0.44
1:H:561:PHE:HB2	1:H:585:ILE:HD13	2.00	0.44
1:H:663:GLU:OE2	1:H:701:LYS:NZ	2.43	0.44
1:D:623:ILE:O	1:D:626:GLN:NE2	2.50	0.43
1:C:700:VAL:CG2	1:C:741:VAL:HG21	2.48	0.43
1:A:623:ILE:O	1:A:626:GLN:NE2	2.50	0.43
1:G:708:TYR:OH	1:G:742:ASP:OD1	2.28	0.43
1:E:657:SER:HB2	1:E:707:LYS:HD2	2.01	0.43
1:H:642:VAL:HG21	1:H:670:LEU:HD21	2.02	0.42
1:F:588:LEU:HB3	1:F:589:PRO:CD	2.50	0.42
1:A:575:VAL:HG13	1:A:585:ILE:CD1	2.50	0.42
1:D:619:LEU:O	1:D:623:ILE:HD12	2.19	0.42
1:F:575:VAL:HG13	1:F:585:ILE:CD1	2.50	0.42
1:E:650:GLU:HA	1:E:675:GLY:O	2.20	0.42
1:B:700:VAL:CG2	1:B:741:VAL:HG21	2.50	0.42
1:B:682:PHE:CE1	1:B:698:LEU:HB2	2.55	0.41
1:C:681:PHE:HB2	1:C:692:MET:HE1	2.02	0.41
1:C:579:ARG:NE	1:C:585:ILE:HD12	2.35	0.41
1:E:642:VAL:HG21	1:E:670:LEU:HD21	2.03	0.41
1:H:636:LEU:HD12	1:H:663:GLU:HG3	2.02	0.41
1:G:655:SER:O	1:G:698:LEU:HD12	2.21	0.41
1:G:686:ALA:N	1:G:694:ALA:HB2	2.36	0.41
1:H:686:ALA:HB2	1:H:694:ALA:HB2	2.03	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:602:LEU:HG	1:F:626:GLN:OE1	2.21	0.41
1:C:559:LYS:HD2	1:C:596:TYR:HE2	1.86	0.40
1:F:575:VAL:HG22	1:F:585:ILE:HD13	2.03	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	188/200 (94%)	185 (98%)	3 (2%)	0	100	100
1	B	188/200 (94%)	182 (97%)	5 (3%)	1 (0%)	29	52
1	C	188/200 (94%)	182 (97%)	4 (2%)	2 (1%)	14	30
1	D	188/200 (94%)	182 (97%)	6 (3%)	0	100	100
1	E	189/200 (94%)	187 (99%)	2 (1%)	0	100	100
1	F	189/200 (94%)	177 (94%)	9 (5%)	3 (2%)	9	19
1	G	189/200 (94%)	182 (96%)	7 (4%)	0	100	100
1	H	189/200 (94%)	180 (95%)	8 (4%)	1 (0%)	29	52
2	L	3/13 (23%)	3 (100%)	0	0	100	100
2	M	3/13 (23%)	3 (100%)	0	0	100	100
2	N	3/13 (23%)	3 (100%)	0	0	100	100
2	O	7/13 (54%)	7 (100%)	0	0	100	100
All	All	1524/1652 (92%)	1473 (97%)	44 (3%)	7 (0%)	29	52

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	684	ARG

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Mol	Chain	Res	Type
1	F	588	LEU
1	F	589	PRO
1	H	588	LEU
1	F	684	ARG
1	B	689	LYS
1	C	688	ALA

### 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	165/172 (96%)	165 (100%)	0	100	100
1	B	165/172 (96%)	165 (100%)	0	100	100
1	C	165/172 (96%)	164 (99%)	1 (1%)	86	95
1	D	165/172 (96%)	164 (99%)	1 (1%)	86	95
1	E	166/172 (96%)	165 (99%)	1 (1%)	86	95
1	F	166/172 (96%)	166 (100%)	0	100	100
1	G	166/172 (96%)	165 (99%)	1 (1%)	86	95
1	H	166/172 (96%)	164 (99%)	2 (1%)	71	87
2	L	5/12 (42%)	5 (100%)	0	100	100
2	M	5/12 (42%)	5 (100%)	0	100	100
2	N	4/12 (33%)	4 (100%)	0	100	100
2	O	9/12 (75%)	9 (100%)	0	100	100
All	All	1347/1424 (95%)	1341 (100%)	6 (0%)	91	97

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

Mol	Chain	Res	Type
1	C	693	LEU
1	D	681	PHE
1	E	700	VAL
1	G	692	MET

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Mol	Chain	Res	Type
1	H	588	LEU
1	H	693	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	687	ASN
1	D	687	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](#)

4 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
2	SEP	N	304	2	8,9,10	1.55	1 (12%)	8,12,14	1.58	2 (25%)
2	SEP	L	304	2	8,9,10	1.52	1 (12%)	8,12,14	1.46	2 (25%)
2	SEP	O	304	2	8,9,10	1.58	1 (12%)	8,12,14	1.50	2 (25%)
2	SEP	M	304	2	8,9,10	1.54	1 (12%)	8,12,14	1.63	2 (25%)

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	SEP	N	304	2	-	0/5/8/10	-
2	SEP	L	304	2	-	3/5/8/10	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	SEP	O	304	2	-	4/5/8/10	-
2	SEP	M	304	2	-	3/5/8/10	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	O	304	SEP	P-O1P	3.40	1.61	1.50
2	N	304	SEP	P-O1P	3.39	1.61	1.50
2	M	304	SEP	P-O1P	3.37	1.61	1.50
2	L	304	SEP	P-O1P	3.33	1.61	1.50

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	M	304	SEP	OG-CB-CA	3.03	111.09	108.14
2	N	304	SEP	P-OG-CB	-2.97	110.11	118.30
2	M	304	SEP	P-OG-CB	-2.86	110.41	118.30
2	N	304	SEP	OG-CB-CA	2.82	110.89	108.14
2	L	304	SEP	P-OG-CB	-2.76	110.70	118.30
2	O	304	SEP	OG-CB-CA	2.74	110.81	108.14
2	O	304	SEP	P-OG-CB	-2.61	111.10	118.30
2	L	304	SEP	OG-CB-CA	2.44	110.52	108.14

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	L	304	SEP	CB-OG-P-O1P
2	L	304	SEP	CB-OG-P-O3P
2	M	304	SEP	CB-OG-P-O1P
2	M	304	SEP	CB-OG-P-O3P
2	O	304	SEP	CB-OG-P-O1P
2	O	304	SEP	CB-OG-P-O3P
2	O	304	SEP	CA-CB-OG-P
2	L	304	SEP	CB-OG-P-O2P
2	M	304	SEP	CB-OG-P-O2P
2	O	304	SEP	CB-OG-P-O2P

There are no ring outliers.

3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	N	304	SEP	1	0
2	L	304	SEP	1	0
2	O	304	SEP	1	0

## 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	190/200 (95%)	0.09	4 (2%) 63 58	36, 71, 136, 162	0
1	B	190/200 (95%)	0.22	4 (2%) 63 58	60, 88, 142, 189	0
1	C	190/200 (95%)	0.16	3 (1%) 72 68	48, 75, 129, 182	0
1	D	190/200 (95%)	0.18	4 (2%) 63 58	58, 90, 141, 196	0
1	E	191/200 (95%)	0.50	16 (8%) 11 7	44, 93, 160, 192	0
1	F	191/200 (95%)	1.48	50 (26%) 0 0	62, 146, 232, 275	0
1	G	191/200 (95%)	1.37	52 (27%) 0 0	59, 131, 211, 242	0
1	H	191/200 (95%)	2.20	80 (41%) 0 0	63, 153, 264, 301	0
2	L	5/13 (38%)	2.68	3 (60%) 0 0	139, 149, 156, 164	0
2	M	5/13 (38%)	2.95	4 (80%) 0 0	151, 156, 162, 171	1 (20%)
2	N	4/13 (30%)	2.42	3 (75%) 0 0	141, 145, 172, 204	1 (25%)
2	O	9/13 (69%)	1.10	2 (22%) 0 0	107, 122, 132, 160	3 (33%)
All	All	1547/1652 (93%)	0.79	225 (14%) 2 1	36, 93, 218, 301	5 (0%)

All (225) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	H	741	VAL	12.8
1	H	703	PRO	10.6
1	F	688	ALA	10.1
1	H	698	LEU	10.0
1	H	656	PHE	9.8
1	H	654	ILE	9.7
1	G	741	VAL	9.3
1	F	676	ALA	8.9
1	H	689	LYS	8.4
1	H	690	LYS	7.9
1	H	716	LEU	7.9

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	H	739	PHE	7.9
1	G	740	LEU	7.5
1	H	709	GLU	7.5
1	F	719	VAL	7.5
1	H	712	LYS	7.3
1	H	743	ASN	7.2
1	G	721	ILE	7.0
1	H	702	GLU	6.9
1	F	703	PRO	6.9
1	H	699	ILE	6.8
1	H	681	PHE	6.6
1	F	687	ASN	6.6
1	F	651	ASP	6.6
1	F	674	LEU	6.5
1	F	743	ASN	6.4
1	F	738	HIS	6.4
1	G	690	LYS	6.2
1	F	721	ILE	6.0
1	H	708	TYR	6.0
1	H	697	HIS	6.0
1	F	741	VAL	6.0
1	F	671	ALA	5.9
1	F	684	ARG	5.8
1	G	719	VAL	5.8
1	F	672	ASN	5.7
1	H	738	HIS	5.7
1	H	671	ALA	5.7
1	H	692	MET	5.6
1	H	683	VAL	5.6
1	H	742	ASP	5.5
1	F	732	LYS	5.5
1	G	689	LYS	5.4
1	G	692	MET	5.4
1	F	692	MET	5.3
1	F	739	PHE	5.3
1	H	704	THR	5.3
1	G	743	ASN	5.3
2	M	300	PHE	5.2
1	E	689	LYS	5.2
1	F	704	THR	5.2
1	H	695	SER	5.2
1	H	740	LEU	5.1

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	H	660	VAL	5.1
1	H	719	VAL	5.1
1	F	712	LYS	5.1
1	H	721	ILE	5.0
1	H	674	LEU	5.0
1	H	682	PHE	5.0
1	G	683	VAL	5.0
1	C	691	GLY	5.0
1	G	698	LEU	5.0
1	F	649	LEU	4.9
1	G	723	TRP	4.9
1	G	735	ASP	4.9
1	H	720	ASN	4.8
1	F	698	LEU	4.8
1	H	710	ALA	4.8
1	H	649	LEU	4.8
1	G	738	HIS	4.8
1	H	711	ALA	4.7
2	L	305	PRO	4.7
1	E	742	ASP	4.6
1	F	742	ASP	4.6
1	H	706	SER	4.5
2	N	300	PHE	4.5
1	E	743	ASN	4.5
1	G	720	ASN	4.5
1	H	686	ALA	4.5
1	H	717	PRO	4.4
1	G	731	GLY	4.4
1	G	654	ILE	4.4
1	G	730	ILE	4.4
1	H	655	SER	4.4
1	H	691	GLY	4.3
1	H	693	LEU	4.3
1	H	659	CYS	4.3
1	F	730	ILE	4.3
1	G	725	LEU	4.3
1	H	701	LYS	4.2
1	F	642	VAL	4.2
1	G	709	GLU	4.2
1	H	705	GLY	4.1
1	D	691	GLY	4.0
1	G	691	GLY	4.0

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	G	708	TYR	3.9
1	G	701	LYS	3.9
1	G	671	ALA	3.9
1	H	714	TRP	3.8
1	H	725	LEU	3.8
1	G	693	LEU	3.8
1	G	652	CYS	3.8
1	H	734	ALA	3.8
1	H	713	LYS	3.8
1	G	676	ALA	3.8
1	A	743	ASN	3.7
1	G	656	PHE	3.7
1	H	723	TRP	3.7
1	H	642	VAL	3.7
1	E	738	HIS	3.7
2	M	305	PRO	3.6
1	G	724	LEU	3.6
1	G	699	ILE	3.6
1	F	686	ALA	3.6
1	G	702	GLU	3.6
1	F	728	ALA	3.6
1	F	734	ALA	3.5
1	F	645	GLY	3.5
1	G	703	PRO	3.5
1	F	670	LEU	3.5
1	H	694	ALA	3.5
1	F	731	GLY	3.5
1	F	675	GLY	3.4
1	H	687	ASN	3.4
1	G	732	LYS	3.4
1	H	668	VAL	3.4
1	G	682	PHE	3.4
1	C	690	LYS	3.4
1	G	734	ALA	3.4
1	H	653	VAL	3.4
1	H	700	VAL	3.4
1	H	676	ALA	3.3
1	H	677	SER	3.3
1	H	737	ASN	3.3
1	F	691	GLY	3.3
1	F	727	THR	3.2
1	H	643	MET	3.2

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	H	688	ALA	3.2
1	G	649	LEU	3.2
1	E	728	ALA	3.2
1	G	717	PRO	3.2
1	F	681	PHE	3.2
1	H	651	ASP	3.2
1	G	704	THR	3.2
1	G	651	ASP	3.2
1	F	720	ASN	3.2
1	E	690	LYS	3.1
1	G	739	PHE	3.1
1	F	708	TYR	3.1
1	E	741	VAL	3.1
1	H	715	SER	3.0
1	E	692	MET	3.0
1	H	718	ALA	3.0
1	H	680	GLU	3.0
1	E	676	ALA	3.0
1	G	726	GLU	3.0
1	H	670	LEU	3.0
2	L	302	PRO	3.0
1	H	732	LYS	2.9
1	E	646	VAL	2.9
2	L	300	PHE	2.8
1	H	728	ALA	2.8
1	H	591	ARG	2.8
1	E	651	ASP	2.8
1	F	709	GLU	2.8
1	G	728	ALA	2.7
1	D	692	MET	2.7
1	G	742	ASP	2.7
1	H	658	GLN	2.7
1	E	712	LYS	2.7
2	O	300	PHE	2.7
2	N	301	VAL	2.7
1	F	717	PRO	2.7
1	H	652	CYS	2.7
1	H	684	ARG	2.7
1	G	711	ALA	2.6
1	B	741	VAL	2.6
1	G	737	ASN	2.6
1	F	723	TRP	2.6

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	H	730	ILE	2.6
2	M	302	PRO	2.5
1	H	724	LEU	2.5
1	F	673	HIS	2.5
1	B	743	ASN	2.5
1	H	645	GLY	2.5
1	F	726	GLU	2.5
1	H	696	THR	2.5
1	H	675	GLY	2.5
1	F	714	TRP	2.5
1	G	697	HIS	2.5
1	D	689	LYS	2.5
1	H	735	ASP	2.5
1	B	651	ASP	2.4
1	H	685	LYS	2.4
1	E	719	VAL	2.4
1	H	588	LEU	2.4
2	O	301	VAL	2.4
1	G	670	LEU	2.4
2	M	301	VAL	2.3
1	E	739	PHE	2.3
1	F	733	ARG	2.3
1	A	681	PHE	2.3
1	G	712	LYS	2.2
1	B	691	GLY	2.2
1	G	718	ALA	2.2
2	N	302	PRO	2.2
1	D	741	VAL	2.1
1	F	725	LEU	2.1
1	E	682	PHE	2.1
1	E	726	GLU	2.1
1	F	702	GLU	2.1
1	G	681	PHE	2.1
1	H	672	ASN	2.1
1	F	646	VAL	2.1
1	F	668	VAL	2.1
1	F	724	LEU	2.1
1	F	697	HIS	2.1
1	G	653	VAL	2.1
1	G	700	VAL	2.1
1	F	694	ALA	2.1
1	A	692	MET	2.1

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Mol	Chain	Res	Type	RSRZ
1	G	707	LYS	2.0
1	C	608	VAL	2.0
1	A	687	ASN	2.0
1	H	727	THR	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
2	SEP	M	304	10/11	0.81	0.15	150,153,156,157	0
2	SEP	N	304	10/11	0.82	0.18	89,128,139,142	0
2	SEP	L	304	10/11	0.89	0.14	133,139,145,146	0
2	SEP	O	304	10/11	0.91	0.16	126,129,132,138	0

## 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.