



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 6, 2026 – 02:19 PM UTC

PDB ID : 4RYD / pdb\_00004ryd  
Title : X-ray structure of human furin in complex with the competitive inhibitor par  
a-guanidinomethyl-Phac-R-Tle-R-Amba  
Authors : Dahms, S.O.; Than, M.E.  
Deposited on : 2014-12-15  
Resolution : 2.15 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 : 4-5-2 with Phenix2.0  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtriage (Phenix) : 2.0  
EDS : 3.0  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
CCP4 : 9.0.010 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.49

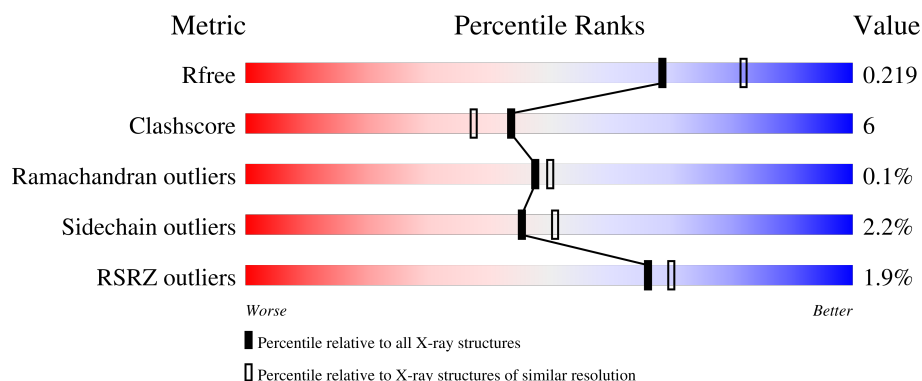
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

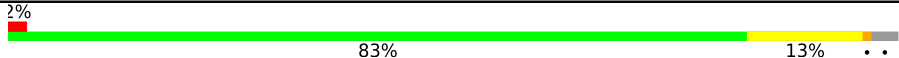
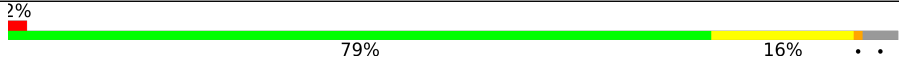



The reported resolution of this entry is 2.15 Å.

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))
$R_{free}$	180053	2057 (2.16-2.16)
Clashscore	190562	2159 (2.16-2.16)
Ramachandran outliers	187476	2134 (2.16-2.16)
Sidechain outliers	187428	2133 (2.16-2.16)
RSRZ outliers	180081	2059 (2.16-2.16)

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 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	482	
1	B	482	
1	C	482	
1	D	482	
1	E	482	

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Mol	Chain	Length	Quality of chain
1	F	482	<div><div></div><div>2%</div><div>78%</div><div>17%</div><div></div><div></div></div>
2	H	5	<div><div></div><div>80%</div><div>20%</div><div></div><div></div></div>
2	I	5	<div><div></div><div>80%</div><div>20%</div><div></div><div></div></div>
2	J	5	<div><div></div><div>80%</div><div>20%</div><div></div><div></div></div>
2	K	5	<div><div></div><div>80%</div><div>20%</div><div></div><div></div></div>
2	L	5	<div><div></div><div>80%</div><div>20%</div><div></div><div></div></div>
2	N	5	<div><div></div><div>80%</div><div>20%</div><div></div><div></div></div>

## 2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 23768 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 Furin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	466	Total	C	N	O	S	30	0	0
			3559	2204	637	704	14			
1	B	465	Total	C	N	O	S	31	0	0
			3552	2199	636	703	14			
1	C	466	Total	C	N	O	S	28	0	0
			3559	2204	637	704	14			
1	D	465	Total	C	N	O	S	39	0	0
			3552	2199	636	703	14			
1	E	465	Total	C	N	O	S	33	0	0
			3552	2199	636	703	14			
1	F	465	Total	C	N	O	S	40	0	0
			3552	2199	636	703	14			

There are 90 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	575	SER	-	expression tag	UNP P09958
A	576	GLY	-	expression tag	UNP P09958
A	577	SER	-	expression tag	UNP P09958
A	578	LEU	-	expression tag	UNP P09958
A	579	VAL	-	expression tag	UNP P09958
A	580	PRO	-	expression tag	UNP P09958
A	581	ARG	-	expression tag	UNP P09958
A	582	GLY	-	expression tag	UNP P09958
A	583	SER	-	expression tag	UNP P09958
A	584	HIS	-	expression tag	UNP P09958
A	585	HIS	-	expression tag	UNP P09958
A	586	HIS	-	expression tag	UNP P09958
A	587	HIS	-	expression tag	UNP P09958
A	588	HIS	-	expression tag	UNP P09958
A	589	HIS	-	expression tag	UNP P09958
B	575	SER	-	expression tag	UNP P09958
B	576	GLY	-	expression tag	UNP P09958

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Chain	Residue	Modelled	Actual	Comment	Reference
B	577	SER	-	expression tag	UNP P09958
B	578	LEU	-	expression tag	UNP P09958
B	579	VAL	-	expression tag	UNP P09958
B	580	PRO	-	expression tag	UNP P09958
B	581	ARG	-	expression tag	UNP P09958
B	582	GLY	-	expression tag	UNP P09958
B	583	SER	-	expression tag	UNP P09958
B	584	HIS	-	expression tag	UNP P09958
B	585	HIS	-	expression tag	UNP P09958
B	586	HIS	-	expression tag	UNP P09958
B	587	HIS	-	expression tag	UNP P09958
B	588	HIS	-	expression tag	UNP P09958
B	589	HIS	-	expression tag	UNP P09958
C	575	SER	-	expression tag	UNP P09958
C	576	GLY	-	expression tag	UNP P09958
C	577	SER	-	expression tag	UNP P09958
C	578	LEU	-	expression tag	UNP P09958
C	579	VAL	-	expression tag	UNP P09958
C	580	PRO	-	expression tag	UNP P09958
C	581	ARG	-	expression tag	UNP P09958
C	582	GLY	-	expression tag	UNP P09958
C	583	SER	-	expression tag	UNP P09958
C	584	HIS	-	expression tag	UNP P09958
C	585	HIS	-	expression tag	UNP P09958
C	586	HIS	-	expression tag	UNP P09958
C	587	HIS	-	expression tag	UNP P09958
C	588	HIS	-	expression tag	UNP P09958
C	589	HIS	-	expression tag	UNP P09958
D	575	SER	-	expression tag	UNP P09958
D	576	GLY	-	expression tag	UNP P09958
D	577	SER	-	expression tag	UNP P09958
D	578	LEU	-	expression tag	UNP P09958
D	579	VAL	-	expression tag	UNP P09958
D	580	PRO	-	expression tag	UNP P09958
D	581	ARG	-	expression tag	UNP P09958
D	582	GLY	-	expression tag	UNP P09958
D	583	SER	-	expression tag	UNP P09958
D	584	HIS	-	expression tag	UNP P09958
D	585	HIS	-	expression tag	UNP P09958
D	586	HIS	-	expression tag	UNP P09958
D	587	HIS	-	expression tag	UNP P09958
D	588	HIS	-	expression tag	UNP P09958

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Chain	Residue	Modelled	Actual	Comment	Reference
D	589	HIS	-	expression tag	UNP P09958
E	575	SER	-	expression tag	UNP P09958
E	576	GLY	-	expression tag	UNP P09958
E	577	SER	-	expression tag	UNP P09958
E	578	LEU	-	expression tag	UNP P09958
E	579	VAL	-	expression tag	UNP P09958
E	580	PRO	-	expression tag	UNP P09958
E	581	ARG	-	expression tag	UNP P09958
E	582	GLY	-	expression tag	UNP P09958
E	583	SER	-	expression tag	UNP P09958
E	584	HIS	-	expression tag	UNP P09958
E	585	HIS	-	expression tag	UNP P09958
E	586	HIS	-	expression tag	UNP P09958
E	587	HIS	-	expression tag	UNP P09958
E	588	HIS	-	expression tag	UNP P09958
E	589	HIS	-	expression tag	UNP P09958
F	575	SER	-	expression tag	UNP P09958
F	576	GLY	-	expression tag	UNP P09958
F	577	SER	-	expression tag	UNP P09958
F	578	LEU	-	expression tag	UNP P09958
F	579	VAL	-	expression tag	UNP P09958
F	580	PRO	-	expression tag	UNP P09958
F	581	ARG	-	expression tag	UNP P09958
F	582	GLY	-	expression tag	UNP P09958
F	583	SER	-	expression tag	UNP P09958
F	584	HIS	-	expression tag	UNP P09958
F	585	HIS	-	expression tag	UNP P09958
F	586	HIS	-	expression tag	UNP P09958
F	587	HIS	-	expression tag	UNP P09958
F	588	HIS	-	expression tag	UNP P09958
F	589	HIS	-	expression tag	UNP P09958

- Molecule 2 is a protein called para-guanidinomethyl-phenylacetyl-Arg-(3-methylvaline)-Arg-(amidomethyl)benzamidine.

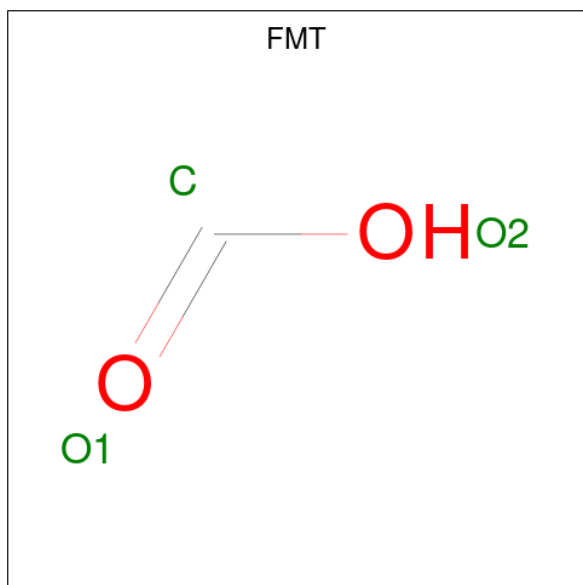
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	H	5	Total	C	N	O	0	0	0
			55	36	15	4			
2	I	5	Total	C	N	O	0	0	0
			55	36	15	4			
2	J	5	Total	C	N	O	0	0	0
			55	36	15	4			

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	K	5	Total	C	N	O	0	0	0
			55	36	15	4			
2	L	5	Total	C	N	O	0	0	0
			55	36	15	4			
2	N	5	Total	C	N	O	0	0	0
			55	36	15	4			

- Molecule 3 is FORMIC ACID (CCD ID: FMT) (formula: CH<sub>2</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			3	1	2		
3	A	1	Total	C	O	0	0
			3	1	2		
3	A	1	Total	C	O	0	0
			3	1	2		
3	B	1	Total	C	O	0	0
			3	1	2		
3	B	1	Total	C	O	0	0
			3	1	2		
3	B	1	Total	C	O	0	0
			3	1	2		
3	C	1	Total	C	O	0	0
			3	1	2		
3	C	1	Total	C	O	0	0
			3	1	2		

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	C	1	Total C O 3 1 2	0	0
3	D	1	Total C O 3 1 2	0	0
3	D	1	Total C O 3 1 2	0	0
3	D	1	Total C O 3 1 2	0	0
3	E	1	Total C O 3 1 2	0	0
3	E	1	Total C O 3 1 2	0	0
3	E	1	Total C O 3 1 2	0	0
3	F	1	Total C O 3 1 2	0	0
3	F	1	Total C O 3 1 2	0	0
3	F	1	Total C O 3 1 2	0	0

- Molecule 4 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	3	Total Ca 3 3	0	0
4	B	3	Total Ca 3 3	0	0
4	C	3	Total Ca 3 3	0	0
4	D	3	Total Ca 3 3	0	0
4	E	3	Total Ca 3 3	0	0
4	F	3	Total Ca 3 3	0	0

- Molecule 5 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total Na 1 1	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	B	1	Total 1	Na 1	0	0
5	C	1	Total 1	Na 1	0	0
5	D	1	Total 1	Na 1	0	0
5	E	1	Total 1	Na 1	0	0
5	F	1	Total 1	Na 1	0	0

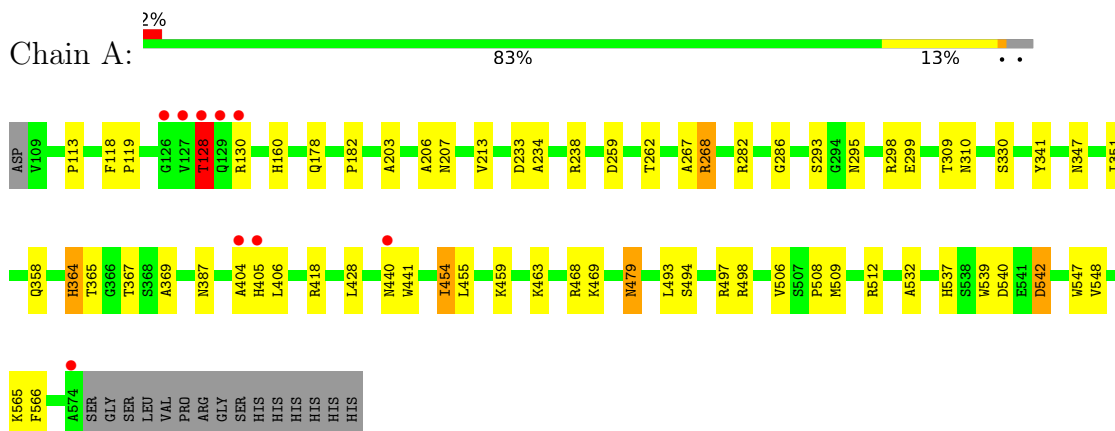
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	356	Total 356	O 356	0	0
6	B	323	Total 323	O 323	0	0
6	C	374	Total 374	O 374	0	0
6	D	313	Total 313	O 313	0	0
6	E	338	Total 338	O 338	0	0
6	F	299	Total 299	O 299	0	0
6	H	4	Total 4	O 4	0	0
6	I	3	Total 3	O 3	0	0
6	J	6	Total 6	O 6	0	0
6	K	9	Total 9	O 9	0	0
6	L	4	Total 4	O 4	0	0
6	N	5	Total 5	O 5	0	0

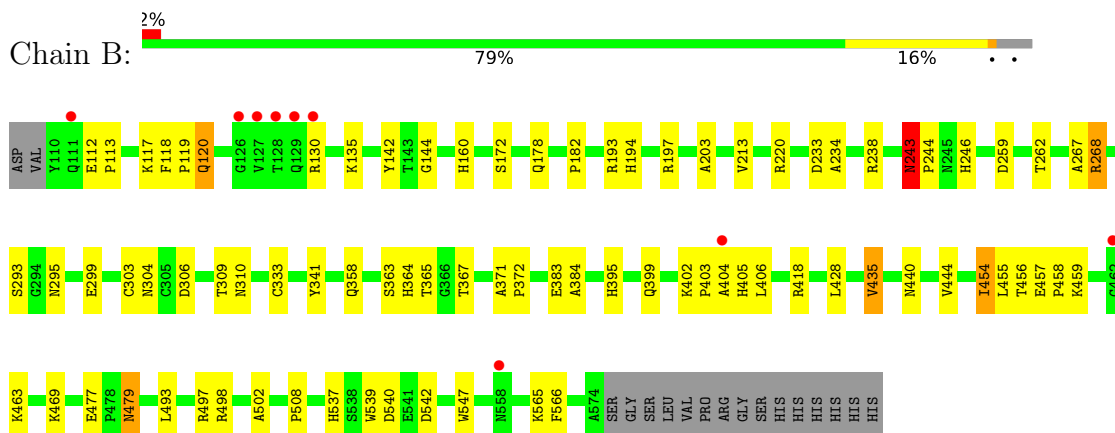
### 3 Residue-property plots [i](#)

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.

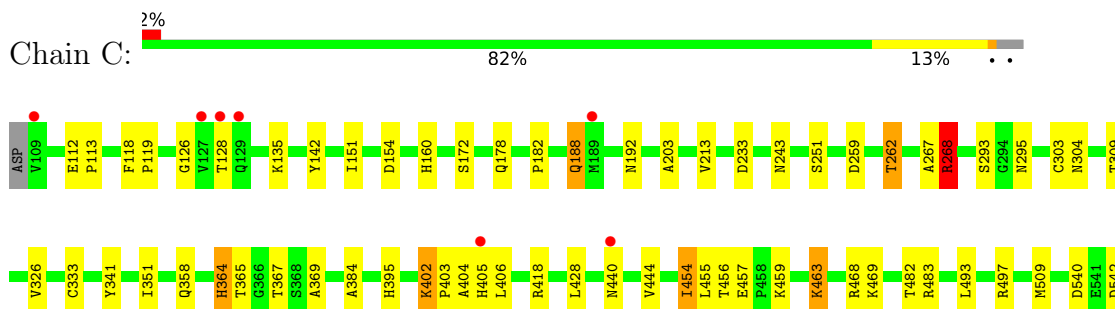
#### • Molecule 1: Furin



#### • Molecule 1: Furin



#### • Molecule 1: Furin






2UE1	R2	V3	R4	00S5
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- Molecule 2: para-guanidinomethyl-phenylacetyl-Arg-(3-methylvaline)-Arg-(amidomethyl)benzamide

Chain I:  80% 20%


2UE1	R2	V3	R4	00S5
------	----	----	----	------

- Molecule 2: para-guanidinomethyl-phenylacetyl-Arg-(3-methylvaline)-Arg-(amidomethyl)benzamide

Chain J:  80% 20%

2UE1	R2	V3	R4	00S5
------	----	----	----	------

- Molecule 2: para-guanidinomethyl-phenylacetyl-Arg-(3-methylvaline)-Arg-(amidomethyl)benzamide

Chain K:  80% 20%


2UE1	R2	V3	R4	00S5
------	----	----	----	------

- Molecule 2: para-guanidinomethyl-phenylacetyl-Arg-(3-methylvaline)-Arg-(amidomethyl)benzamide

Chain L:  80% 20%

2UE1	R2	V3	R4	00S5
------	----	----	----	------

- Molecule 2: para-guanidinomethyl-phenylacetyl-Arg-(3-methylvaline)-Arg-(amidomethyl)benzamide

Chain N:  80% 20%

2UE1	R2	V3	R4	00S5
------	----	----	----	------

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	141.65Å 152.70Å 168.40Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 2.15 50.00 – 2.15	Depositor EDS
% Data completeness (in resolution range)	(Not available) (50.00-2.15) 98.3 (50.00-2.15)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.14	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.08 (at 2.14Å)	Xtriage
Refinement program	CNS	Depositor
R, $R_{free}$	0.186 , 0.219 0.186 , 0.219	Depositor DCC
$R_{free}$ test set	9740 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	24.2	Xtriage
Anisotropy	0.449	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 49.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	23768	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	25.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.25% 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: TBG, CA, 00S, NA, 2UE, FMT

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	0.47	0/3641	0.96	12/4964 (0.2%)
1	B	0.44	0/3634	0.97	16/4954 (0.3%)
1	C	0.46	0/3641	0.96	9/4964 (0.2%)
1	D	0.45	0/3634	0.95	8/4954 (0.2%)
1	E	0.45	0/3634	0.95	8/4954 (0.2%)
1	F	0.44	0/3634	0.95	14/4954 (0.3%)
2	H	0.34	0/20	0.91	0/22
2	I	0.30	0/20	0.90	0/22
2	J	0.38	0/20	0.95	0/22
2	K	0.34	0/20	1.00	0/22
2	L	0.37	0/20	0.90	0/22
2	N	0.32	0/20	0.97	0/22
All	All	0.45	0/21938	0.96	67/29876 (0.2%)

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	E	0	1

There are no bond length outliers.

The worst 5 of 67 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	454	ILE	N-CA-C	10.14	120.66	110.82
1	F	454	ILE	N-CA-C	9.86	120.39	110.82
1	C	454	ILE	N-CA-C	9.80	120.33	110.82
1	B	454	ILE	N-CA-C	9.78	120.31	110.82

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	454	ILE	N-CA-C	9.57	120.10	110.82

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	E	424	TYR	Sidechain

## 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	3559	0	3376	39	0
1	B	3552	0	3367	47	0
1	C	3559	0	3376	41	0
1	D	3552	0	3367	38	0
1	E	3552	0	3367	43	0
1	F	3552	0	3367	51	0
2	H	55	0	54	0	0
2	I	55	0	54	0	0
2	J	55	0	54	0	0
2	K	55	0	54	0	0
2	L	55	0	54	0	0
2	N	55	0	54	0	0
3	A	9	0	3	0	0
3	B	9	0	3	0	0
3	C	9	0	3	0	0
3	D	9	0	3	1	0
3	E	9	0	3	0	0
3	F	9	0	3	0	0
4	A	3	0	0	0	0
4	B	3	0	0	0	0
4	C	3	0	0	0	0
4	D	3	0	0	0	0
4	E	3	0	0	0	0
4	F	3	0	0	0	0
5	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	B	1	0	0	0	0
5	C	1	0	0	0	0
5	D	1	0	0	0	0
5	E	1	0	0	0	0
5	F	1	0	0	0	0
6	A	356	0	0	6	0
6	B	323	0	0	3	0
6	C	374	0	0	4	0
6	D	313	0	0	3	0
6	E	338	0	0	5	0
6	F	299	0	0	4	0
6	H	4	0	0	0	0
6	I	3	0	0	0	0
6	J	6	0	0	0	0
6	K	9	0	0	0	0
6	L	4	0	0	0	0
6	N	5	0	0	0	0
All	All	23768	0	20562	255	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 6.

The worst 5 of 255 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:479:ASN:HD22	1:B:479:ASN:H	1.11	0.96
1:E:479:ASN:HD22	1:E:479:ASN:H	0.96	0.95
1:F:479:ASN:H	1:F:479:ASN:HD22	1.13	0.94
1:D:479:ASN:H	1:D:479:ASN:HD22	1.16	0.90
1:E:259:ASP:OD1	1:E:262:THR:HG23	1.71	0.90

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	464/482 (96%)	442 (95%)	21 (4%)	1 (0%)	43	44
1	B	463/482 (96%)	441 (95%)	22 (5%)	0	100	100
1	C	464/482 (96%)	441 (95%)	22 (5%)	1 (0%)	43	44
1	D	463/482 (96%)	441 (95%)	22 (5%)	0	100	100
1	E	463/482 (96%)	440 (95%)	23 (5%)	0	100	100
1	F	463/482 (96%)	441 (95%)	22 (5%)	0	100	100
All	All	2780/2892 (96%)	2646 (95%)	132 (5%)	2 (0%)	48	50

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	128	THR
1	C	128	THR

### 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	376/390 (96%)	368 (98%)	8 (2%)	47	52
1	B	375/390 (96%)	364 (97%)	11 (3%)	37	39
1	C	376/390 (96%)	367 (98%)	9 (2%)	43	47
1	D	375/390 (96%)	366 (98%)	9 (2%)	43	47
1	E	375/390 (96%)	370 (99%)	5 (1%)	61	68
1	F	375/390 (96%)	367 (98%)	8 (2%)	47	52
2	H	2/2 (100%)	2 (100%)	0	100	100
2	I	2/2 (100%)	2 (100%)	0	100	100
2	J	2/2 (100%)	2 (100%)	0	100	100
2	K	2/2 (100%)	2 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	L	2/2 (100%)	2 (100%)	0	100	100
2	N	2/2 (100%)	2 (100%)	0	100	100
All	All	2264/2352 (96%)	2214 (98%)	50 (2%)	45	51

5 of 50 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	127	VAL
1	D	479	ASN
1	F	497	ARG
1	D	129	GLN
1	D	303	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 43 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	243	ASN
1	E	479	ASN
1	E	300	HIS
1	E	387	ASN
1	F	346	GLN

### 5.3.3 RNA ⓘ

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
2	TBG	H	3	2	6,7,8	2.24	2 (33%)	8,10,12	1.31	1 (12%)
2	TBG	N	3	2	6,7,8	2.36	2 (33%)	8,10,12	1.32	1 (12%)
2	TBG	L	3	2	6,7,8	2.54	2 (33%)	8,10,12	1.29	1 (12%)
2	TBG	I	3	2	6,7,8	2.29	2 (33%)	8,10,12	1.22	1 (12%)
2	TBG	J	3	2	6,7,8	2.31	2 (33%)	8,10,12	1.34	1 (12%)
2	TBG	K	3	2	6,7,8	2.57	2 (33%)	8,10,12	1.35	1 (12%)

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	TBG	H	3	2	-	0/6/8/10	-
2	TBG	N	3	2	-	0/6/8/10	-
2	TBG	L	3	2	-	0/6/8/10	-
2	TBG	I	3	2	-	0/6/8/10	-
2	TBG	J	3	2	-	0/6/8/10	-
2	TBG	K	3	2	-	0/6/8/10	-

The worst 5 of 12 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	J	3	TBG	CA-N	-5.15	1.33	1.48
2	K	3	TBG	CA-N	-5.10	1.33	1.48
2	L	3	TBG	CA-N	-5.07	1.33	1.48
2	I	3	TBG	CA-N	-5.04	1.33	1.48
2	H	3	TBG	CA-N	-5.04	1.33	1.48

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	K	3	TBG	C-CA-N	3.58	115.76	110.34
2	J	3	TBG	C-CA-N	3.56	115.75	110.34
2	N	3	TBG	C-CA-N	3.50	115.64	110.34
2	H	3	TBG	C-CA-N	3.41	115.51	110.34
2	L	3	TBG	C-CA-N	3.39	115.48	110.34

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

## 5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 42 ligands modelled in this entry, 24 are monoatomic - leaving 18 for Mogul analysis.

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	FMT	A	603	-	2,2,2	0.64	0	1,1,1	0.06	0
3	FMT	C	603	-	2,2,2	0.66	0	1,1,1	0.07	0
3	FMT	A	601	-	2,2,2	0.62	0	1,1,1	0.04	0
3	FMT	C	602	-	2,2,2	0.74	0	1,1,1	0.03	0
3	FMT	D	602	-	2,2,2	0.60	0	1,1,1	0.06	0
3	FMT	E	601	-	2,2,2	0.63	0	1,1,1	0.05	0
3	FMT	F	601	-	2,2,2	0.66	0	1,1,1	0.03	0
3	FMT	B	602	-	2,2,2	0.67	0	1,1,1	0.06	0
3	FMT	D	601	-	2,2,2	0.64	0	1,1,1	0.04	0
3	FMT	D	603	-	2,2,2	0.63	0	1,1,1	0.04	0
3	FMT	A	602	-	2,2,2	0.65	0	1,1,1	0.04	0
3	FMT	C	601	-	2,2,2	0.63	0	1,1,1	0.03	0
3	FMT	F	603	-	2,2,2	0.61	0	1,1,1	0.04	0
3	FMT	F	602	-	2,2,2	0.63	0	1,1,1	0.05	0
3	FMT	B	603	-	2,2,2	0.62	0	1,1,1	0.06	0
3	FMT	E	603	-	2,2,2	0.61	0	1,1,1	0.05	0
3	FMT	E	602	-	2,2,2	0.61	0	1,1,1	0.06	0
3	FMT	B	601	-	2,2,2	0.71	0	1,1,1	0.03	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	603	FMT	1	0

## 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	466/482 (96%)	-0.39	9 (1%) 66 70	13, 21, 38, 53	11 (2%)
1	B	465/482 (96%)	-0.32	9 (1%) 66 70	14, 23, 39, 63	12 (2%)
1	C	466/482 (96%)	-0.43	8 (1%) 69 73	14, 21, 35, 54	11 (2%)
1	D	465/482 (96%)	-0.28	7 (1%) 72 76	12, 23, 38, 59	16 (3%)
1	E	465/482 (96%)	-0.31	9 (1%) 66 70	8, 23, 37, 67	9 (1%)
1	F	465/482 (96%)	-0.22	10 (2%) 62 66	16, 25, 41, 62	14 (3%)
2	H	2/5 (40%)	-0.83	0 100 100	19, 19, 19, 20	0
2	I	2/5 (40%)	-0.88	0 100 100	21, 21, 21, 22	0
2	J	2/5 (40%)	-0.90	0 100 100	22, 22, 22, 23	0
2	K	2/5 (40%)	-0.80	0 100 100	20, 20, 20, 20	0
2	L	2/5 (40%)	-0.80	0 100 100	22, 22, 22, 22	0
2	N	2/5 (40%)	-0.82	0 100 100	21, 21, 21, 23	0
All	All	2804/2922 (95%)	-0.33	52 (1%) 66 70	8, 23, 39, 67	73 (2%)

The worst 5 of 52 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	128	THR	6.4
1	B	127	VAL	5.7
1	F	128	THR	5.6
1	E	128	THR	5.2
1	E	127	VAL	5.1

### 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	TBG	L	3	8/9	0.94	0.07	19,22,24,24	0
2	TBG	H	3	8/9	0.95	0.07	17,20,22,24	0
2	TBG	N	3	8/9	0.95	0.07	20,23,25,26	0
2	TBG	K	3	8/9	0.96	0.06	11,16,19,19	0
2	TBG	I	3	8/9	0.96	0.07	20,21,23,24	0
2	TBG	J	3	8/9	0.96	0.06	17,21,24,24	0

### 6.3 Carbohydrates [i](#)

There are no oligosaccharides 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
3	FMT	B	601	3/3	0.82	0.13	29,29,31,35	0
3	FMT	A	602	3/3	0.84	0.14	31,31,32,36	0
3	FMT	F	601	3/3	0.84	0.13	27,27,34,35	0
3	FMT	E	601	3/3	0.85	0.16	46,46,48,48	0
3	FMT	C	602	3/3	0.85	0.12	22,22,24,31	0
3	FMT	B	603	3/3	0.87	0.14	47,47,47,48	0
3	FMT	D	601	3/3	0.88	0.10	29,29,30,33	0
3	FMT	C	601	3/3	0.89	0.12	34,34,41,41	0
3	FMT	E	602	3/3	0.91	0.10	23,23,28,30	0
3	FMT	A	601	3/3	0.93	0.09	37,37,38,39	0
3	FMT	D	603	3/3	0.95	0.07	30,30,34,38	0
3	FMT	F	603	3/3	0.95	0.10	38,38,39,41	0
3	FMT	C	603	3/3	0.97	0.05	21,21,21,24	0
3	FMT	E	603	3/3	0.98	0.04	19,19,19,24	0
3	FMT	A	603	3/3	0.98	0.04	21,21,23,24	0
3	FMT	F	602	3/3	0.98	0.05	19,19,24,25	0
3	FMT	B	602	3/3	0.98	0.04	20,20,21,21	0
4	CA	C	606	1/1	0.98	0.03	33,33,33,33	0
5	NA	B	607	1/1	0.98	0.03	16,16,16,16	0
5	NA	C	607	1/1	0.98	0.03	18,18,18,18	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
5	NA	E	607	1/1	0.98	0.02	20,20,20,20	0
3	FMT	D	602	3/3	0.99	0.04	26,26,27,33	0
4	CA	D	604	1/1	0.99	0.03	24,24,24,24	0
4	CA	D	606	1/1	0.99	0.01	24,24,24,24	0
4	CA	E	604	1/1	0.99	0.02	25,25,25,25	0
4	CA	E	605	1/1	0.99	0.02	17,17,17,17	0
4	CA	E	606	1/1	0.99	0.05	33,33,33,33	0
4	CA	F	604	1/1	0.99	0.02	27,27,27,27	0
4	CA	F	606	1/1	0.99	0.02	31,31,31,31	0
5	NA	A	607	1/1	0.99	0.01	16,16,16,16	0
4	CA	A	606	1/1	0.99	0.02	31,31,31,31	0
4	CA	B	604	1/1	0.99	0.02	28,28,28,28	0
5	NA	D	607	1/1	0.99	0.01	16,16,16,16	0
4	CA	B	606	1/1	0.99	0.04	38,38,38,38	0
5	NA	F	607	1/1	0.99	0.04	18,18,18,18	0
4	CA	D	605	1/1	1.00	0.02	19,19,19,19	0
4	CA	A	604	1/1	1.00	0.01	20,20,20,20	0
4	CA	C	604	1/1	1.00	0.01	17,17,17,17	0
4	CA	C	605	1/1	1.00	0.02	20,20,20,20	0
4	CA	A	605	1/1	1.00	0.01	15,15,15,15	0
4	CA	B	605	1/1	1.00	0.01	18,18,18,18	0
4	CA	F	605	1/1	1.00	0.01	17,17,17,17	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.