



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2026 – 06:31 AM UTC

PDB ID : 4U39 / pdb_00004u39
Title : Crystal Structure of FtsZ:MciZ Complex from Bacillus subtilis
Authors : Bisson-Filho, A.W.; Discola, K.F.; Castellen, P.; Blasios, V.; Martins, A.; Sforca, M.L.; Garcia, W.; Zeri, A.C.; Erickson, H.P.; Dessen, A.; Gueiros-Filho, F.J.
Deposited on : 2014-07-19
Resolution : 3.19 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

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

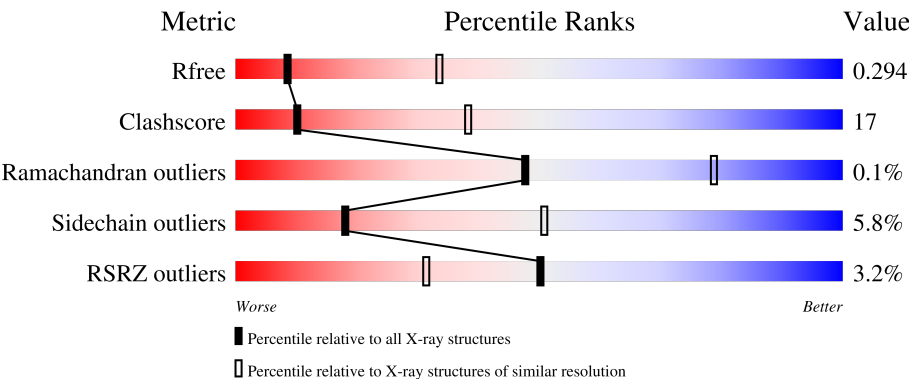
MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 3.19 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	1466 (3.20-3.20)
Clashscore	190562	1573 (3.20-3.20)
Ramachandran outliers	187476	1548 (3.20-3.20)
Sidechain outliers	187428	1547 (3.20-3.20)
RSRZ outliers	180081	1466 (3.20-3.20)

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 ≥ 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	305	0% 54% 40% • •
1	B	305	4% 66% 28% • 5%
1	C	305	3% 60% 32% • 6%
1	D	305	3% 64% 24% • 8%
1	E	305	5% 58% 33% • 6%

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Mol	Chain	Length	Quality of chain
1	F	305	
1	G	305	
1	H	305	
1	I	305	
2	J	60	
2	K	60	
2	L	60	
2	M	60	
2	N	60	
2	O	60	
2	P	60	
2	Q	60	
2	R	60	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	PO4	H	402	-	-	X	-

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 19225 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 Cell division protein FtsZ.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	294	Total	C	N	O	S	0	0	0
			2074	1288	360	417	9			
1	B	289	Total	C	N	O	S	0	0	0
			1951	1205	349	389	8			
1	C	288	Total	C	N	O	S	0	0	0
			2030	1259	356	406	9			
1	D	280	Total	C	N	O	S	0	0	0
			1951	1211	342	389	9			
1	E	286	Total	C	N	O	S	0	0	0
			1970	1223	346	392	9			
1	F	284	Total	C	N	O	S	0	0	0
			1991	1235	350	396	10			
1	G	279	Total	C	N	O	S	0	0	0
			1935	1197	338	390	10			
1	H	269	Total	C	N	O	S	0	0	0
			1854	1151	331	363	9			
1	I	270	Total	C	N	O	S	0	0	0
			1849	1151	326	362	10			

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	11	MET	-	initiating methionine	UNP P17865
B	11	MET	-	initiating methionine	UNP P17865
C	11	MET	-	initiating methionine	UNP P17865
D	11	MET	-	initiating methionine	UNP P17865
E	11	MET	-	initiating methionine	UNP P17865
F	11	MET	-	initiating methionine	UNP P17865
G	11	MET	-	initiating methionine	UNP P17865
H	11	MET	-	initiating methionine	UNP P17865
I	11	MET	-	initiating methionine	UNP P17865

- Molecule 2 is a protein called Cell division factor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	J	36	Total	C	N	O	S	0	0	0
			268	178	44	45	1			
2	K	15	Total	C	N	O		0	0	0
			86	55	16	15				
2	L	30	Total	C	N	O		0	0	0
			221	149	33	39				
2	M	25	Total	C	N	O		0	0	0
			147	90	29	28				
2	N	27	Total	C	N	O		0	0	0
			189	127	32	30				
2	O	28	Total	C	N	O		0	0	0
			205	137	34	34				
2	P	21	Total	C	N	O		0	0	0
			149	99	25	25				
2	Q	27	Total	C	N	O		0	0	0
			161	106	28	27				
2	R	18	Total	C	N	O		0	0	0
			114	73	22	19				

There are 180 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
J	-19	MET	-	expression tag	UNP L8EBJ9
J	-18	GLY	-	expression tag	UNP L8EBJ9
J	-17	SER	-	expression tag	UNP L8EBJ9
J	-16	SER	-	expression tag	UNP L8EBJ9
J	-15	HIS	-	expression tag	UNP L8EBJ9
J	-14	HIS	-	expression tag	UNP L8EBJ9
J	-13	HIS	-	expression tag	UNP L8EBJ9
J	-12	HIS	-	expression tag	UNP L8EBJ9
J	-11	HIS	-	expression tag	UNP L8EBJ9
J	-10	HIS	-	expression tag	UNP L8EBJ9
J	-9	SER	-	expression tag	UNP L8EBJ9
J	-8	SER	-	expression tag	UNP L8EBJ9
J	-7	GLY	-	expression tag	UNP L8EBJ9
J	-6	LEU	-	expression tag	UNP L8EBJ9
J	-5	VAL	-	expression tag	UNP L8EBJ9
J	-4	PRO	-	expression tag	UNP L8EBJ9
J	-3	ARG	-	expression tag	UNP L8EBJ9
J	-2	GLY	-	expression tag	UNP L8EBJ9
J	-1	SER	-	expression tag	UNP L8EBJ9
J	0	HIS	-	expression tag	UNP L8EBJ9
K	-19	MET	-	expression tag	UNP L8EBJ9
K	-18	GLY	-	expression tag	UNP L8EBJ9

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Chain	Residue	Modelled	Actual	Comment	Reference
K	-17	SER	-	expression tag	UNP L8EBJ9
K	-16	SER	-	expression tag	UNP L8EBJ9
K	-15	HIS	-	expression tag	UNP L8EBJ9
K	-14	HIS	-	expression tag	UNP L8EBJ9
K	-13	HIS	-	expression tag	UNP L8EBJ9
K	-12	HIS	-	expression tag	UNP L8EBJ9
K	-11	HIS	-	expression tag	UNP L8EBJ9
K	-10	HIS	-	expression tag	UNP L8EBJ9
K	-9	SER	-	expression tag	UNP L8EBJ9
K	-8	SER	-	expression tag	UNP L8EBJ9
K	-7	GLY	-	expression tag	UNP L8EBJ9
K	-6	LEU	-	expression tag	UNP L8EBJ9
K	-5	VAL	-	expression tag	UNP L8EBJ9
K	-4	PRO	-	expression tag	UNP L8EBJ9
K	-3	ARG	-	expression tag	UNP L8EBJ9
K	-2	GLY	-	expression tag	UNP L8EBJ9
K	-1	SER	-	expression tag	UNP L8EBJ9
K	0	HIS	-	expression tag	UNP L8EBJ9
L	-19	MET	-	expression tag	UNP L8EBJ9
L	-18	GLY	-	expression tag	UNP L8EBJ9
L	-17	SER	-	expression tag	UNP L8EBJ9
L	-16	SER	-	expression tag	UNP L8EBJ9
L	-15	HIS	-	expression tag	UNP L8EBJ9
L	-14	HIS	-	expression tag	UNP L8EBJ9
L	-13	HIS	-	expression tag	UNP L8EBJ9
L	-12	HIS	-	expression tag	UNP L8EBJ9
L	-11	HIS	-	expression tag	UNP L8EBJ9
L	-10	HIS	-	expression tag	UNP L8EBJ9
L	-9	SER	-	expression tag	UNP L8EBJ9
L	-8	SER	-	expression tag	UNP L8EBJ9
L	-7	GLY	-	expression tag	UNP L8EBJ9
L	-6	LEU	-	expression tag	UNP L8EBJ9
L	-5	VAL	-	expression tag	UNP L8EBJ9
L	-4	PRO	-	expression tag	UNP L8EBJ9
L	-3	ARG	-	expression tag	UNP L8EBJ9
L	-2	GLY	-	expression tag	UNP L8EBJ9
L	-1	SER	-	expression tag	UNP L8EBJ9
L	0	HIS	-	expression tag	UNP L8EBJ9
M	-19	MET	-	expression tag	UNP L8EBJ9
M	-18	GLY	-	expression tag	UNP L8EBJ9
M	-17	SER	-	expression tag	UNP L8EBJ9
M	-16	SER	-	expression tag	UNP L8EBJ9

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Chain	Residue	Modelled	Actual	Comment	Reference
M	-15	HIS	-	expression tag	UNP L8EBJ9
M	-14	HIS	-	expression tag	UNP L8EBJ9
M	-13	HIS	-	expression tag	UNP L8EBJ9
M	-12	HIS	-	expression tag	UNP L8EBJ9
M	-11	HIS	-	expression tag	UNP L8EBJ9
M	-10	HIS	-	expression tag	UNP L8EBJ9
M	-9	SER	-	expression tag	UNP L8EBJ9
M	-8	SER	-	expression tag	UNP L8EBJ9
M	-7	GLY	-	expression tag	UNP L8EBJ9
M	-6	LEU	-	expression tag	UNP L8EBJ9
M	-5	VAL	-	expression tag	UNP L8EBJ9
M	-4	PRO	-	expression tag	UNP L8EBJ9
M	-3	ARG	-	expression tag	UNP L8EBJ9
M	-2	GLY	-	expression tag	UNP L8EBJ9
M	-1	SER	-	expression tag	UNP L8EBJ9
M	0	HIS	-	expression tag	UNP L8EBJ9
N	-19	MET	-	expression tag	UNP L8EBJ9
N	-18	GLY	-	expression tag	UNP L8EBJ9
N	-17	SER	-	expression tag	UNP L8EBJ9
N	-16	SER	-	expression tag	UNP L8EBJ9
N	-15	HIS	-	expression tag	UNP L8EBJ9
N	-14	HIS	-	expression tag	UNP L8EBJ9
N	-13	HIS	-	expression tag	UNP L8EBJ9
N	-12	HIS	-	expression tag	UNP L8EBJ9
N	-11	HIS	-	expression tag	UNP L8EBJ9
N	-10	HIS	-	expression tag	UNP L8EBJ9
N	-9	SER	-	expression tag	UNP L8EBJ9
N	-8	SER	-	expression tag	UNP L8EBJ9
N	-7	GLY	-	expression tag	UNP L8EBJ9
N	-6	LEU	-	expression tag	UNP L8EBJ9
N	-5	VAL	-	expression tag	UNP L8EBJ9
N	-4	PRO	-	expression tag	UNP L8EBJ9
N	-3	ARG	-	expression tag	UNP L8EBJ9
N	-2	GLY	-	expression tag	UNP L8EBJ9
N	-1	SER	-	expression tag	UNP L8EBJ9
N	0	HIS	-	expression tag	UNP L8EBJ9
O	-19	MET	-	expression tag	UNP L8EBJ9
O	-18	GLY	-	expression tag	UNP L8EBJ9
O	-17	SER	-	expression tag	UNP L8EBJ9
O	-16	SER	-	expression tag	UNP L8EBJ9
O	-15	HIS	-	expression tag	UNP L8EBJ9
O	-14	HIS	-	expression tag	UNP L8EBJ9

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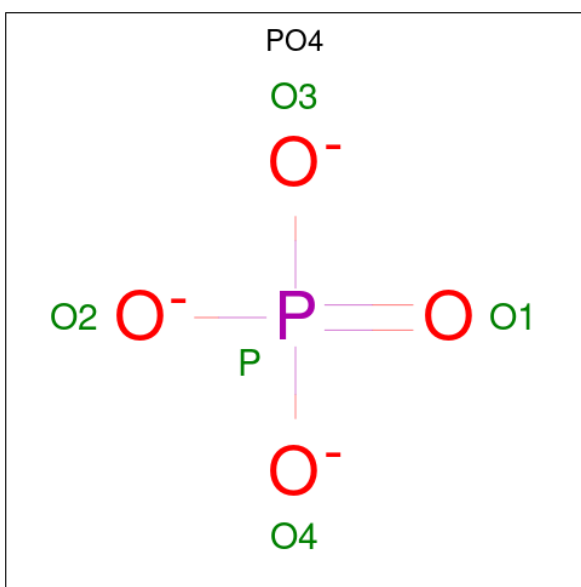
Chain	Residue	Modelled	Actual	Comment	Reference
O	-13	HIS	-	expression tag	UNP L8EBJ9
O	-12	HIS	-	expression tag	UNP L8EBJ9
O	-11	HIS	-	expression tag	UNP L8EBJ9
O	-10	HIS	-	expression tag	UNP L8EBJ9
O	-9	SER	-	expression tag	UNP L8EBJ9
O	-8	SER	-	expression tag	UNP L8EBJ9
O	-7	GLY	-	expression tag	UNP L8EBJ9
O	-6	LEU	-	expression tag	UNP L8EBJ9
O	-5	VAL	-	expression tag	UNP L8EBJ9
O	-4	PRO	-	expression tag	UNP L8EBJ9
O	-3	ARG	-	expression tag	UNP L8EBJ9
O	-2	GLY	-	expression tag	UNP L8EBJ9
O	-1	SER	-	expression tag	UNP L8EBJ9
O	0	HIS	-	expression tag	UNP L8EBJ9
P	-19	MET	-	expression tag	UNP L8EBJ9
P	-18	GLY	-	expression tag	UNP L8EBJ9
P	-17	SER	-	expression tag	UNP L8EBJ9
P	-16	SER	-	expression tag	UNP L8EBJ9
P	-15	HIS	-	expression tag	UNP L8EBJ9
P	-14	HIS	-	expression tag	UNP L8EBJ9
P	-13	HIS	-	expression tag	UNP L8EBJ9
P	-12	HIS	-	expression tag	UNP L8EBJ9
P	-11	HIS	-	expression tag	UNP L8EBJ9
P	-10	HIS	-	expression tag	UNP L8EBJ9
P	-9	SER	-	expression tag	UNP L8EBJ9
P	-8	SER	-	expression tag	UNP L8EBJ9
P	-7	GLY	-	expression tag	UNP L8EBJ9
P	-6	LEU	-	expression tag	UNP L8EBJ9
P	-5	VAL	-	expression tag	UNP L8EBJ9
P	-4	PRO	-	expression tag	UNP L8EBJ9
P	-3	ARG	-	expression tag	UNP L8EBJ9
P	-2	GLY	-	expression tag	UNP L8EBJ9
P	-1	SER	-	expression tag	UNP L8EBJ9
P	0	HIS	-	expression tag	UNP L8EBJ9
Q	-19	MET	-	expression tag	UNP L8EBJ9
Q	-18	GLY	-	expression tag	UNP L8EBJ9
Q	-17	SER	-	expression tag	UNP L8EBJ9
Q	-16	SER	-	expression tag	UNP L8EBJ9
Q	-15	HIS	-	expression tag	UNP L8EBJ9
Q	-14	HIS	-	expression tag	UNP L8EBJ9
Q	-13	HIS	-	expression tag	UNP L8EBJ9
Q	-12	HIS	-	expression tag	UNP L8EBJ9

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Chain	Residue	Modelled	Actual	Comment	Reference
Q	-11	HIS	-	expression tag	UNP L8EBJ9
Q	-10	HIS	-	expression tag	UNP L8EBJ9
Q	-9	SER	-	expression tag	UNP L8EBJ9
Q	-8	SER	-	expression tag	UNP L8EBJ9
Q	-7	GLY	-	expression tag	UNP L8EBJ9
Q	-6	LEU	-	expression tag	UNP L8EBJ9
Q	-5	VAL	-	expression tag	UNP L8EBJ9
Q	-4	PRO	-	expression tag	UNP L8EBJ9
Q	-3	ARG	-	expression tag	UNP L8EBJ9
Q	-2	GLY	-	expression tag	UNP L8EBJ9
Q	-1	SER	-	expression tag	UNP L8EBJ9
Q	0	HIS	-	expression tag	UNP L8EBJ9
R	-19	MET	-	expression tag	UNP L8EBJ9
R	-18	GLY	-	expression tag	UNP L8EBJ9
R	-17	SER	-	expression tag	UNP L8EBJ9
R	-16	SER	-	expression tag	UNP L8EBJ9
R	-15	HIS	-	expression tag	UNP L8EBJ9
R	-14	HIS	-	expression tag	UNP L8EBJ9
R	-13	HIS	-	expression tag	UNP L8EBJ9
R	-12	HIS	-	expression tag	UNP L8EBJ9
R	-11	HIS	-	expression tag	UNP L8EBJ9
R	-10	HIS	-	expression tag	UNP L8EBJ9
R	-9	SER	-	expression tag	UNP L8EBJ9
R	-8	SER	-	expression tag	UNP L8EBJ9
R	-7	GLY	-	expression tag	UNP L8EBJ9
R	-6	LEU	-	expression tag	UNP L8EBJ9
R	-5	VAL	-	expression tag	UNP L8EBJ9
R	-4	PRO	-	expression tag	UNP L8EBJ9
R	-3	ARG	-	expression tag	UNP L8EBJ9
R	-2	GLY	-	expression tag	UNP L8EBJ9
R	-1	SER	-	expression tag	UNP L8EBJ9
R	0	HIS	-	expression tag	UNP L8EBJ9

- Molecule 3 is PHOSPHATE ION (CCD ID: PO4) (formula: O₄P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	O	P	0	0
			5	4	1		
3	A	1	Total	O	P	0	0
			5	4	1		
3	B	1	Total	O	P	0	0
			5	4	1		
3	B	1	Total	O	P	0	0
			5	4	1		
3	C	1	Total	O	P	0	0
			5	4	1		
3	C	1	Total	O	P	0	0
			5	4	1		
3	D	1	Total	O	P	0	0
			5	4	1		
3	D	1	Total	O	P	0	0
			5	4	1		
3	E	1	Total	O	P	0	0
			5	4	1		
3	F	1	Total	O	P	0	0
			5	4	1		
3	G	1	Total	O	P	0	0
			5	4	1		
3	G	1	Total	O	P	0	0
			5	4	1		
3	H	1	Total	O	P	0	0
			5	4	1		
3	H	1	Total	O	P	0	0
			5	4	1		

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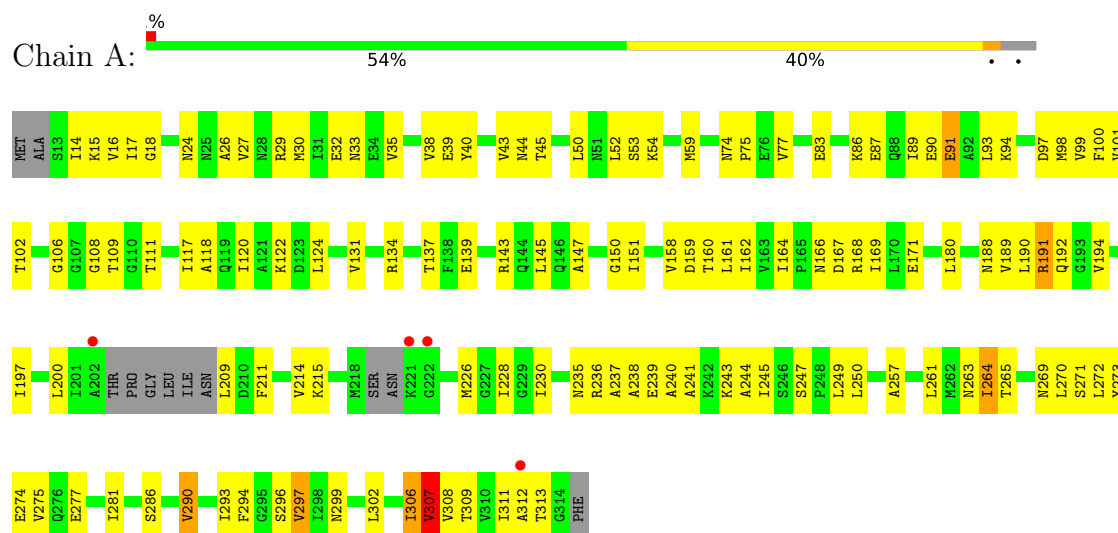
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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	I	1	Total	O	P	0	0
			5	4	1		
3	I	1	Total	O	P	0	0
			5	4	1		

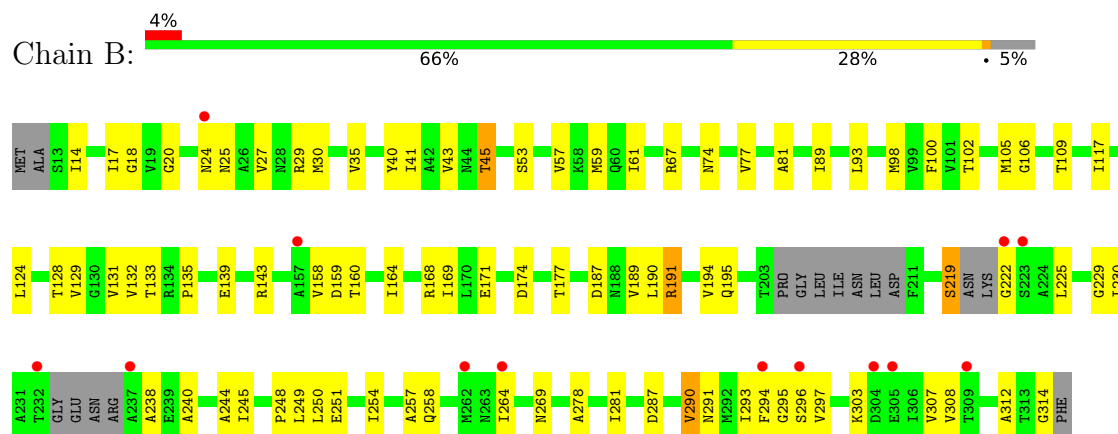
3 Residue-property plots

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.

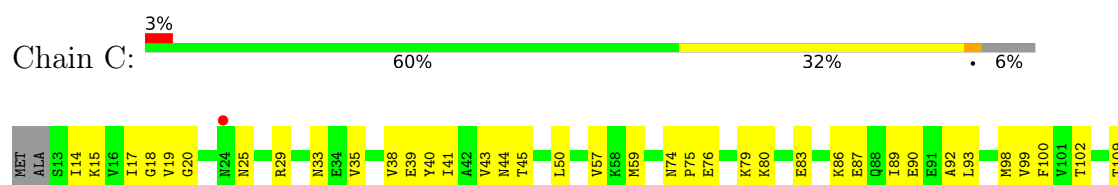
• Molecule 1: Cell division protein FtsZ

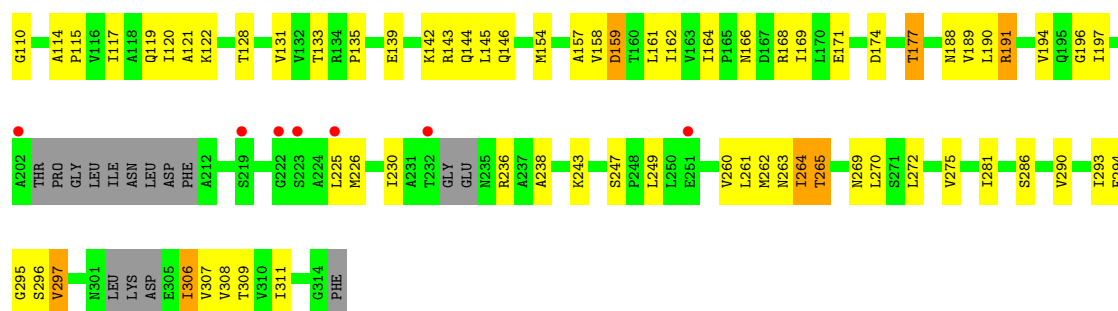


• Molecule 1: Cell division protein FtsZ

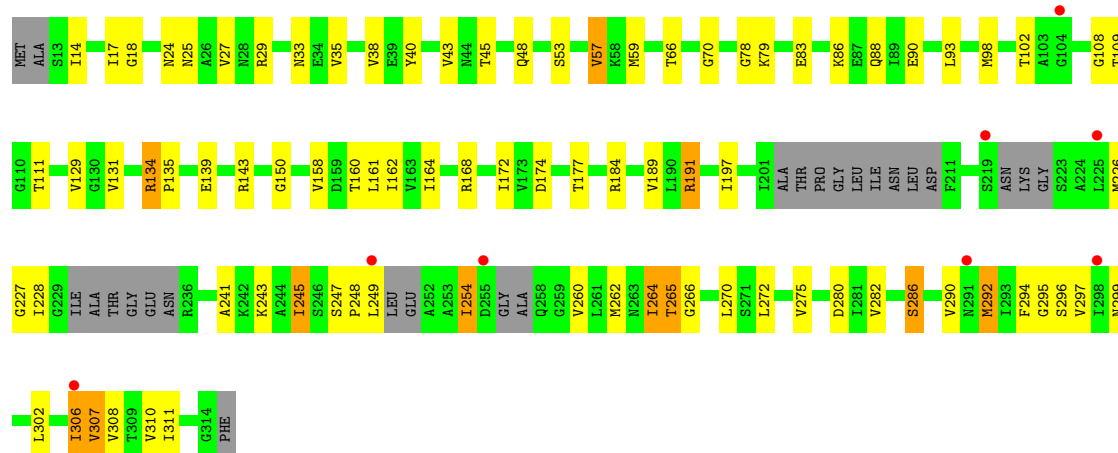


• Molecule 1: Cell division protein FtsZ

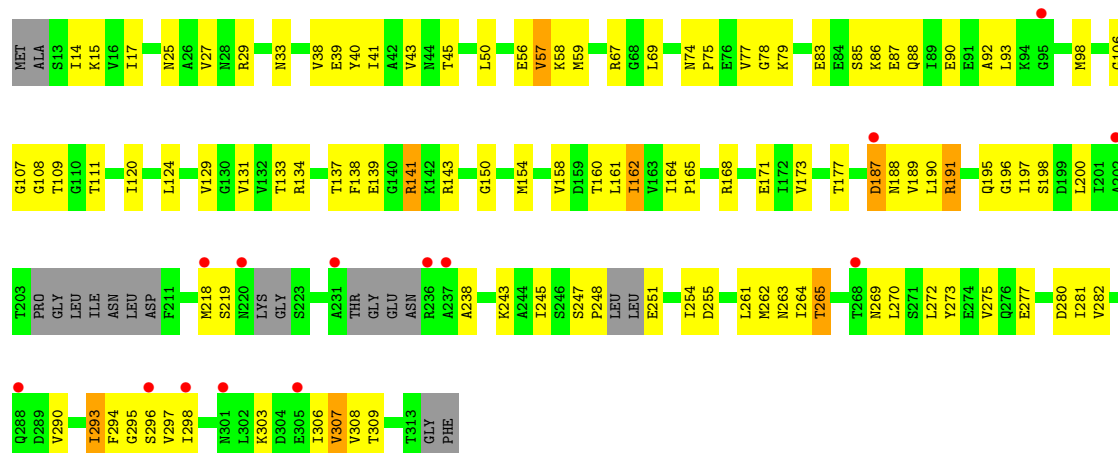




• Molecule 1: Cell division protein FtsZ

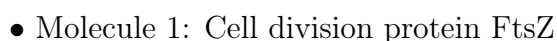


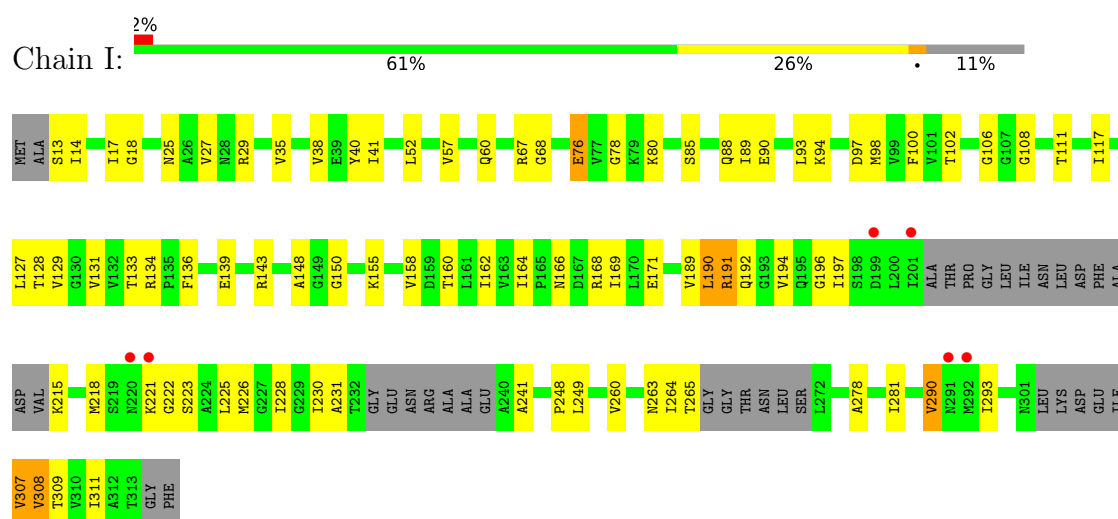
• Molecule 1: Cell division protein FtsZ



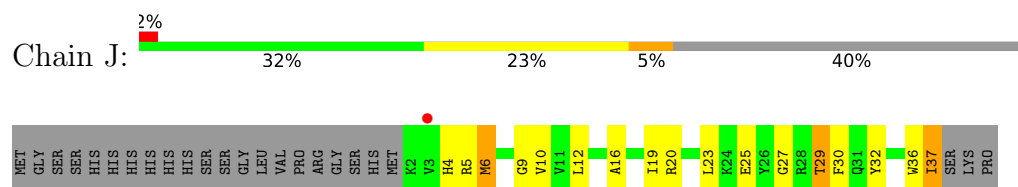
• Molecule 1: Cell division protein FtsZ



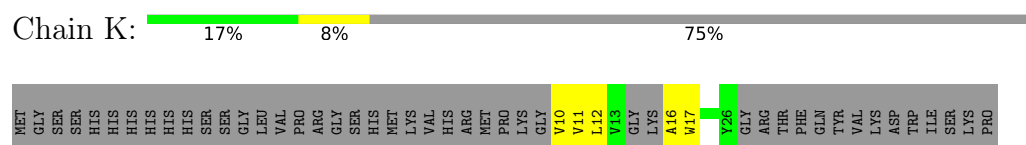




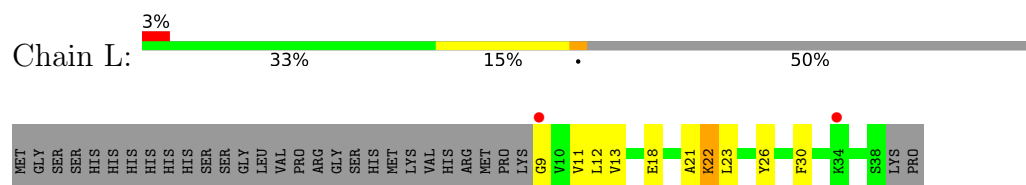
- Molecule 2: Cell division factor



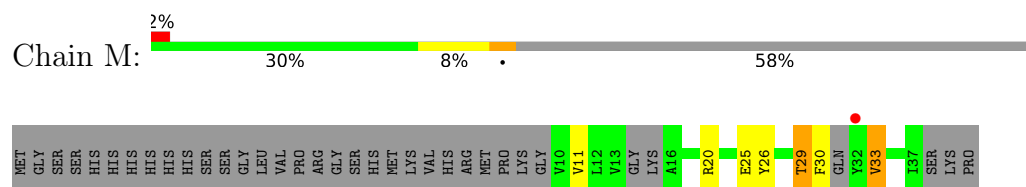
- Molecule 2: Cell division factor



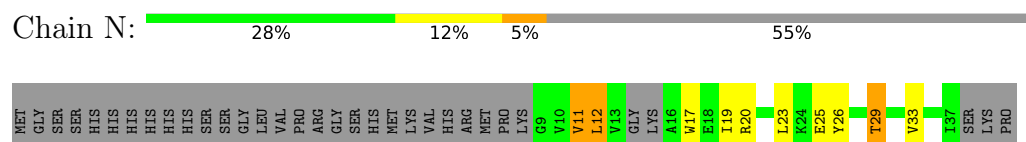
- Molecule 2: Cell division factor



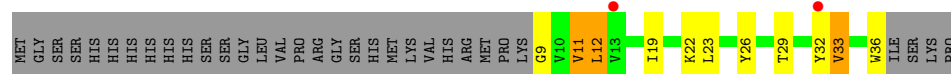
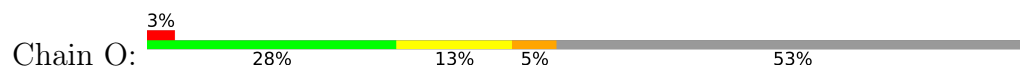
- Molecule 2: Cell division factor



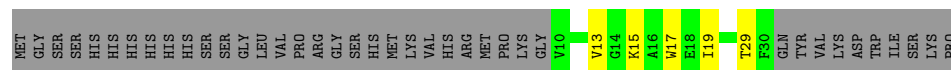
- Molecule 2: Cell division factor



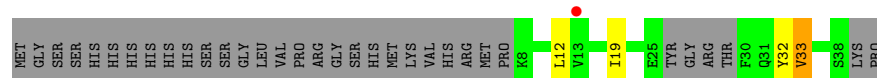
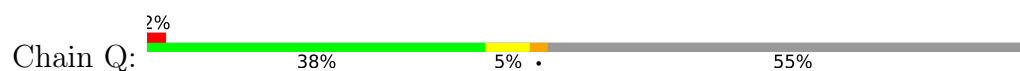
- Molecule 2: Cell division factor



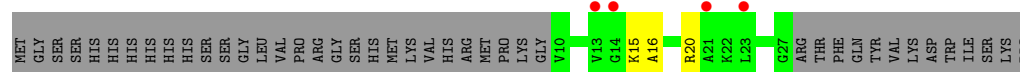
- Molecule 2: Cell division factor



- Molecule 2: Cell division factor



- Molecule 2: Cell division factor



4 Data and refinement statistics

Property	Value	Source
Space group	P 65 2 2	Depositor
Cell constants a, b, c, α , β , γ	167.36Å 167.36Å 528.64Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	46.59 – 3.19 46.59 – 3.19	Depositor EDS
% Data completeness (in resolution range)	97.8 (46.59-3.19) 97.9 (46.59-3.19)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.06	Depositor
$\langle I/\sigma(I) \rangle$ ¹	10.94 (at 3.19Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8_1069)	Depositor
R, R_{free}	0.232 , 0.292 0.238 , 0.294	Depositor DCC
R_{free} test set	3667 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å ²)	80.4	Xtriage
Anisotropy	0.308	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 97.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.44$, $\langle L^2 \rangle = 0.26$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	19225	wwPDB-VP
Average B, all atoms (Å ²)	93.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 20.89 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 7.8760e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

²Theoretical 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](#)

Bond lengths and bond angles in the following residue types are not validated in this section: PO4

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	0.80	0/2085	1.15	6/2819 (0.2%)
1	B	0.67	0/1959	1.04	2/2653 (0.1%)
1	C	0.80	0/2039	1.08	3/2755 (0.1%)
1	D	0.73	0/1957	1.06	3/2643 (0.1%)
1	E	0.69	0/1977	1.08	7/2677 (0.3%)
1	F	0.66	0/1999	1.08	3/2700 (0.1%)
1	G	0.67	0/1942	1.07	6/2626 (0.2%)
1	H	0.67	0/1858	1.07	6/2505 (0.2%)
1	I	0.68	0/1856	1.10	6/2512 (0.2%)
2	J	0.71	0/276	1.05	2/378 (0.5%)
2	K	0.64	0/86	0.99	1/118 (0.8%)
2	L	0.57	0/227	0.97	0/311
2	M	0.56	0/146	1.12	0/198
2	N	0.55	0/194	0.98	0/266
2	O	0.61	0/210	0.97	0/287
2	P	0.58	0/152	1.08	0/208
2	Q	0.62	0/162	1.08	0/222
2	R	0.62	0/116	1.24	0/159
All	All	0.70	0/19241	1.08	45/26037 (0.2%)

There are no bond length outliers.

The worst 5 of 45 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	106	GLY	N-CA-C	-6.89	106.28	114.48
1	E	56	GLU	N-CA-C	-6.56	104.05	111.14
1	I	106	GLY	N-CA-C	-6.54	106.58	113.58
1	I	134	ARG	CA-C-N	6.46	126.83	119.92
1	I	134	ARG	C-N-CA	6.46	126.83	119.92

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2074	0	2080	95	0
1	B	1951	0	1875	62	0
1	C	2030	0	2042	83	0
1	D	1951	0	1946	60	0
1	E	1970	0	1946	79	0
1	F	1991	0	1999	74	0
1	G	1935	0	1917	67	0
1	H	1854	0	1827	56	0
1	I	1849	0	1819	58	0
2	J	268	0	235	18	0
2	K	86	0	49	4	0
2	L	221	0	193	9	0
2	M	147	0	89	6	0
2	N	189	0	145	12	0
2	O	205	0	184	14	0
2	P	149	0	130	2	0
2	Q	161	0	116	3	0
2	R	114	0	83	2	0
3	A	10	0	0	2	0
3	B	10	0	0	0	0
3	C	10	0	0	2	0
3	D	10	0	0	2	0
3	E	5	0	0	1	0
3	F	5	0	0	1	0
3	G	10	0	0	1	0
3	H	10	0	0	2	0
3	I	10	0	0	1	0
All	All	19225	0	18675	650	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 17.

The worst 5 of 650 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:17:ILE:HD11	1:A:93:LEU:HD21	1.36	1.07
1:D:17:ILE:HD11	1:D:93:LEU:HD21	1.45	0.98
1:C:17:ILE:HD11	1:C:93:LEU:HD21	1.45	0.95
1:I:263:ASN:HB3	1:I:309:THR:HB	1.55	0.88
1:F:217:ILE:HD12	1:F:293:ILE:HG13	1.55	0.88

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	288/305 (94%)	283 (98%)	5 (2%)	0	100	100
1	B	281/305 (92%)	276 (98%)	5 (2%)	0	100	100
1	C	280/305 (92%)	273 (98%)	7 (2%)	0	100	100
1	D	268/305 (88%)	266 (99%)	2 (1%)	0	100	100
1	E	276/305 (90%)	271 (98%)	5 (2%)	0	100	100
1	F	274/305 (90%)	270 (98%)	4 (2%)	0	100	100
1	G	269/305 (88%)	265 (98%)	4 (2%)	0	100	100
1	H	253/305 (83%)	247 (98%)	5 (2%)	1 (0%)	30	62
1	I	260/305 (85%)	255 (98%)	4 (2%)	1 (0%)	30	62
2	J	34/60 (57%)	34 (100%)	0	0	100	100
2	K	11/60 (18%)	11 (100%)	0	0	100	100
2	L	28/60 (47%)	27 (96%)	1 (4%)	0	100	100
2	M	19/60 (32%)	19 (100%)	0	0	100	100
2	N	23/60 (38%)	23 (100%)	0	0	100	100
2	O	26/60 (43%)	25 (96%)	1 (4%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	P	19/60 (32%)	18 (95%)	1 (5%)	0	100	100
2	Q	23/60 (38%)	22 (96%)	1 (4%)	0	100	100
2	R	16/60 (27%)	15 (94%)	0	1 (6%)	1	8
All	All	2648/3285 (81%)	2600 (98%)	45 (2%)	3 (0%)	48	79

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	R	15	LYS
1	I	222	GLY
1	H	222	GLY

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	205/227 (90%)	195 (95%)	10 (5%)	22	55
1	B	174/227 (77%)	168 (97%)	6 (3%)	32	64
1	C	200/227 (88%)	189 (94%)	11 (6%)	19	52
1	D	190/227 (84%)	179 (94%)	11 (6%)	18	51
1	E	187/227 (82%)	175 (94%)	12 (6%)	16	48
1	F	196/227 (86%)	188 (96%)	8 (4%)	27	60
1	G	188/227 (83%)	177 (94%)	11 (6%)	18	50
1	H	173/227 (76%)	165 (95%)	8 (5%)	24	58
1	I	172/227 (76%)	165 (96%)	7 (4%)	27	60
2	J	22/52 (42%)	20 (91%)	2 (9%)	9	34
2	K	2/52 (4%)	1 (50%)	1 (50%)	0	0
2	L	18/52 (35%)	15 (83%)	3 (17%)	2	11
2	M	5/52 (10%)	3 (60%)	2 (40%)	0	0
2	N	11/52 (21%)	8 (73%)	3 (27%)	0	2

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	O	16/52 (31%)	12 (75%)	4 (25%)	0	3
2	P	11/52 (21%)	9 (82%)	2 (18%)	2	9
2	Q	7/52 (14%)	5 (71%)	2 (29%)	0	2
2	R	5/52 (10%)	5 (100%)	0	100	100
All	All	1782/2511 (71%)	1679 (94%)	103 (6%)	18	51

5 of 103 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	F	307	VAL
1	H	187	ASP
2	P	13	VAL
1	G	137	THR
1	G	255	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 9 such sidechains are listed below:

Mol	Chain	Res	Type
1	H	269	ASN
1	I	195	GLN
1	G	144	GLN
1	H	60	GLN
1	H	144	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry

16 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	PO4	A	401	-	4,4,4	0.86	0	6,6,6	0.75	0
3	PO4	C	401	-	4,4,4	1.09	0	6,6,6	0.45	0
3	PO4	C	402	-	4,4,4	1.14	0	6,6,6	1.08	1 (16%)
3	PO4	B	402	-	4,4,4	0.80	0	6,6,6	0.66	0
3	PO4	B	401	-	4,4,4	0.98	0	6,6,6	0.94	0
3	PO4	D	401	-	4,4,4	0.92	0	6,6,6	0.83	0
3	PO4	D	402	-	4,4,4	0.93	0	6,6,6	0.94	0
3	PO4	G	402	-	4,4,4	0.86	0	6,6,6	0.95	0
3	PO4	G	401	-	4,4,4	1.02	0	6,6,6	0.62	0
3	PO4	A	402	-	4,4,4	1.03	0	6,6,6	0.60	0
3	PO4	I	401	-	4,4,4	0.89	0	6,6,6	0.94	0
3	PO4	E	401	-	4,4,4	0.95	0	6,6,6	0.51	0
3	PO4	I	402	-	4,4,4	1.30	0	6,6,6	0.86	0
3	PO4	H	402	-	4,4,4	1.14	0	6,6,6	0.89	0
3	PO4	F	401	-	4,4,4	0.95	0	6,6,6	0.53	0
3	PO4	H	401	-	4,4,4	1.10	0	6,6,6	1.10	0

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
3	C	402	PO4	O4-P-O1	-2.06	103.68	110.95

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

11 monomers are involved in 12 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	401	PO4	1	0
3	C	401	PO4	1	0
3	C	402	PO4	1	0
3	D	401	PO4	1	0
3	D	402	PO4	1	0
3	G	401	PO4	1	0
3	A	402	PO4	1	0
3	I	401	PO4	1	0
3	E	401	PO4	1	0
3	H	402	PO4	2	0
3	F	401	PO4	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

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th 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 ²)	Q<0.9
1	A	294/305 (96%)	-0.18	4 (1%) 73 54	43, 72, 125, 180	0
1	B	289/305 (94%)	0.36	13 (4%) 38 24	48, 102, 158, 209	0
1	C	288/305 (94%)	-0.01	8 (2%) 55 35	43, 77, 137, 197	0
1	D	280/305 (91%)	0.07	8 (2%) 53 35	50, 83, 153, 193	0
1	E	286/305 (93%)	0.10	14 (4%) 35 22	50, 93, 150, 198	0
1	F	284/305 (93%)	0.01	7 (2%) 58 39	52, 92, 146, 233	0
1	G	279/305 (91%)	0.21	9 (3%) 50 31	50, 93, 151, 229	0
1	H	269/305 (88%)	0.09	8 (2%) 52 33	52, 91, 148, 188	0
1	I	270/305 (88%)	0.05	6 (2%) 62 42	46, 94, 150, 204	0
2	J	36/60 (60%)	0.02	1 (2%) 55 35	61, 84, 122, 145	0
2	K	15/60 (25%)	0.64	0 100 100	84, 101, 118, 130	0
2	L	30/60 (50%)	0.36	2 (6%) 24 15	62, 97, 119, 170	0
2	M	25/60 (41%)	0.58	1 (4%) 42 26	69, 106, 138, 145	0
2	N	27/60 (45%)	0.30	0 100 100	73, 104, 138, 189	0
2	O	28/60 (46%)	0.14	2 (7%) 22 14	65, 89, 127, 161	0
2	P	21/60 (35%)	-0.02	0 100 100	63, 90, 113, 158	0
2	Q	27/60 (45%)	0.26	1 (3%) 45 28	75, 100, 114, 157	0
2	R	18/60 (30%)	1.00	4 (22%) 2 2	81, 105, 141, 184	0
All	All	2766/3285 (84%)	0.10	88 (3%) 50 31	43, 90, 147, 233	0

The worst 5 of 88 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	296	SER	5.1
1	H	253	ALA	4.3
1	A	202	ALA	4.2

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Mol	Chain	Res	Type	RSRZ
1	D	219	SER	4.2
1	F	220	ASN	4.0

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 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, 95th 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 ²)	Q<0.9
3	PO4	B	402	5/5	0.80	0.19	120,125,129,132	0
3	PO4	C	401	5/5	0.93	0.13	69,72,74,84	0
3	PO4	B	401	5/5	0.94	0.07	77,78,83,83	0
3	PO4	E	401	5/5	0.94	0.07	72,77,84,87	0
3	PO4	I	401	5/5	0.94	0.09	83,84,85,90	0
3	PO4	D	401	5/5	0.95	0.08	62,62,68,69	0
3	PO4	G	401	5/5	0.96	0.05	76,77,82,84	0
3	PO4	C	402	5/5	0.96	0.08	60,62,71,73	0
3	PO4	A	401	5/5	0.97	0.07	59,63,65,70	0
3	PO4	G	402	5/5	0.97	0.06	50,59,62,67	0
3	PO4	H	401	5/5	0.97	0.06	63,67,74,75	0
3	PO4	H	402	5/5	0.97	0.06	64,67,72,76	0
3	PO4	F	401	5/5	0.97	0.05	72,73,79,80	0
3	PO4	I	402	5/5	0.97	0.07	59,63,72,78	0
3	PO4	A	402	5/5	0.98	0.05	47,55,59,64	0
3	PO4	D	402	5/5	0.99	0.05	57,62,68,69	0

6.5 Other polymers [i](#)

There are no such residues in this entry.