



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 8, 2026 – 10:32 AM UTC

PDB ID : 4MZIP / pdb_00004mzp
Title : MazF from *S. aureus* crystal form III, C2221, 2.7 Å
Authors : Zorzini, V.; Loris, R.; van Nuland, N.A.J.; Cheung, A.
Deposited on : 2013-09-30
Resolution : 2.70 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
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

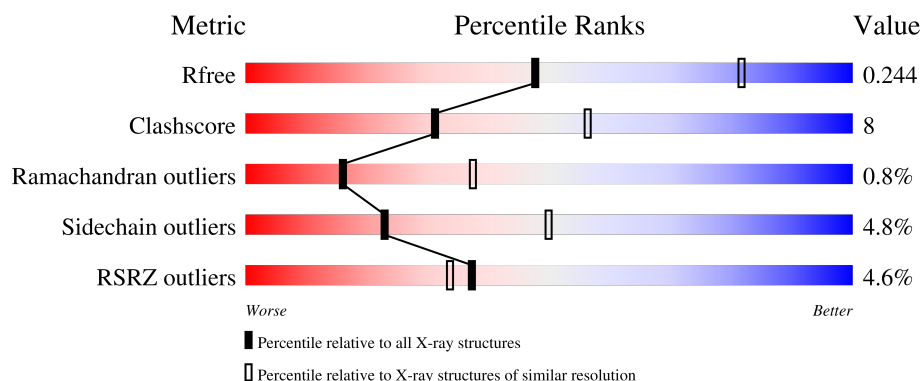
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 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	3538 (2.70-2.70)
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

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	133	
1	B	133	
1	C	133	
1	D	133	
1	E	133	

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Mol	Chain	Length	Quality of chain
1	F	133	3% 71% 12% •• 14%
1	G	133	7% 64% 17% • 15%
1	H	133	2% 74% 11% •• 14%

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 6712 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 MazF mRNA interferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	114	Total	C	N	O	S	0	0	0
			846	535	142	167	2			
1	B	115	Total	C	N	O	S	0	1	0
			860	542	147	169	2			
1	C	113	Total	C	N	O	S	0	0	0
			831	527	141	161	2			
1	D	113	Total	C	N	O	S	0	0	0
			827	525	141	159	2			
1	E	111	Total	C	N	O	S	0	0	1
			818	514	141	161	2			
1	F	114	Total	C	N	O	S	0	0	0
			827	522	141	162	2			
1	G	113	Total	C	N	O	S	0	0	0
			841	533	144	162	2			
1	H	114	Total	C	N	O	S	0	0	0
			862	543	150	167	2			

There are 112 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-12	MET	-	expression tag	UNP Q7A4G9
A	-11	GLY	-	expression tag	UNP Q7A4G9
A	-10	SER	-	expression tag	UNP Q7A4G9
A	-9	SER	-	expression tag	UNP Q7A4G9
A	-8	HIS	-	expression tag	UNP Q7A4G9
A	-7	HIS	-	expression tag	UNP Q7A4G9
A	-6	HIS	-	expression tag	UNP Q7A4G9
A	-5	HIS	-	expression tag	UNP Q7A4G9
A	-4	HIS	-	expression tag	UNP Q7A4G9
A	-3	HIS	-	expression tag	UNP Q7A4G9
A	-2	SER	-	expression tag	UNP Q7A4G9
A	-1	GLN	-	expression tag	UNP Q7A4G9
A	0	ASP	-	expression tag	UNP Q7A4G9

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Chain	Residue	Modelled	Actual	Comment	Reference
A	1	PRO	-	expression tag	UNP Q7A4G9
B	-12	MET	-	expression tag	UNP Q7A4G9
B	-11	GLY	-	expression tag	UNP Q7A4G9
B	-10	SER	-	expression tag	UNP Q7A4G9
B	-9	SER	-	expression tag	UNP Q7A4G9
B	-8	HIS	-	expression tag	UNP Q7A4G9
B	-7	HIS	-	expression tag	UNP Q7A4G9
B	-6	HIS	-	expression tag	UNP Q7A4G9
B	-5	HIS	-	expression tag	UNP Q7A4G9
B	-4	HIS	-	expression tag	UNP Q7A4G9
B	-3	HIS	-	expression tag	UNP Q7A4G9
B	-2	SER	-	expression tag	UNP Q7A4G9
B	-1	GLN	-	expression tag	UNP Q7A4G9
B	0	ASP	-	expression tag	UNP Q7A4G9
B	1	PRO	-	expression tag	UNP Q7A4G9
C	-12	MET	-	expression tag	UNP Q7A4G9
C	-11	GLY	-	expression tag	UNP Q7A4G9
C	-10	SER	-	expression tag	UNP Q7A4G9
C	-9	SER	-	expression tag	UNP Q7A4G9
C	-8	HIS	-	expression tag	UNP Q7A4G9
C	-7	HIS	-	expression tag	UNP Q7A4G9
C	-6	HIS	-	expression tag	UNP Q7A4G9
C	-5	HIS	-	expression tag	UNP Q7A4G9
C	-4	HIS	-	expression tag	UNP Q7A4G9
C	-3	HIS	-	expression tag	UNP Q7A4G9
C	-2	SER	-	expression tag	UNP Q7A4G9
C	-1	GLN	-	expression tag	UNP Q7A4G9
C	0	ASP	-	expression tag	UNP Q7A4G9
C	1	PRO	-	expression tag	UNP Q7A4G9
D	-12	MET	-	expression tag	UNP Q7A4G9
D	-11	GLY	-	expression tag	UNP Q7A4G9
D	-10	SER	-	expression tag	UNP Q7A4G9
D	-9	SER	-	expression tag	UNP Q7A4G9
D	-8	HIS	-	expression tag	UNP Q7A4G9
D	-7	HIS	-	expression tag	UNP Q7A4G9
D	-6	HIS	-	expression tag	UNP Q7A4G9
D	-5	HIS	-	expression tag	UNP Q7A4G9
D	-4	HIS	-	expression tag	UNP Q7A4G9
D	-3	HIS	-	expression tag	UNP Q7A4G9
D	-2	SER	-	expression tag	UNP Q7A4G9
D	-1	GLN	-	expression tag	UNP Q7A4G9
D	0	ASP	-	expression tag	UNP Q7A4G9

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Chain	Residue	Modelled	Actual	Comment	Reference
D	1	PRO	-	expression tag	UNP Q7A4G9
E	-12	MET	-	expression tag	UNP Q7A4G9
E	-11	GLY	-	expression tag	UNP Q7A4G9
E	-10	SER	-	expression tag	UNP Q7A4G9
E	-9	SER	-	expression tag	UNP Q7A4G9
E	-8	HIS	-	expression tag	UNP Q7A4G9
E	-7	HIS	-	expression tag	UNP Q7A4G9
E	-6	HIS	-	expression tag	UNP Q7A4G9
E	-5	HIS	-	expression tag	UNP Q7A4G9
E	-4	HIS	-	expression tag	UNP Q7A4G9
E	-3	HIS	-	expression tag	UNP Q7A4G9
E	-2	SER	-	expression tag	UNP Q7A4G9
E	-1	GLN	-	expression tag	UNP Q7A4G9
E	0	ASP	-	expression tag	UNP Q7A4G9
E	1	PRO	-	expression tag	UNP Q7A4G9
F	-12	MET	-	expression tag	UNP Q7A4G9
F	-11	GLY	-	expression tag	UNP Q7A4G9
F	-10	SER	-	expression tag	UNP Q7A4G9
F	-9	SER	-	expression tag	UNP Q7A4G9
F	-8	HIS	-	expression tag	UNP Q7A4G9
F	-7	HIS	-	expression tag	UNP Q7A4G9
F	-6	HIS	-	expression tag	UNP Q7A4G9
F	-5	HIS	-	expression tag	UNP Q7A4G9
F	-4	HIS	-	expression tag	UNP Q7A4G9
F	-3	HIS	-	expression tag	UNP Q7A4G9
F	-2	SER	-	expression tag	UNP Q7A4G9
F	-1	GLN	-	expression tag	UNP Q7A4G9
F	0	ASP	-	expression tag	UNP Q7A4G9
F	1	PRO	-	expression tag	UNP Q7A4G9
G	-12	MET	-	expression tag	UNP Q7A4G9
G	-11	GLY	-	expression tag	UNP Q7A4G9
G	-10	SER	-	expression tag	UNP Q7A4G9
G	-9	SER	-	expression tag	UNP Q7A4G9
G	-8	HIS	-	expression tag	UNP Q7A4G9
G	-7	HIS	-	expression tag	UNP Q7A4G9
G	-6	HIS	-	expression tag	UNP Q7A4G9
G	-5	HIS	-	expression tag	UNP Q7A4G9
G	-4	HIS	-	expression tag	UNP Q7A4G9
G	-3	HIS	-	expression tag	UNP Q7A4G9
G	-2	SER	-	expression tag	UNP Q7A4G9
G	-1	GLN	-	expression tag	UNP Q7A4G9
G	0	ASP	-	expression tag	UNP Q7A4G9

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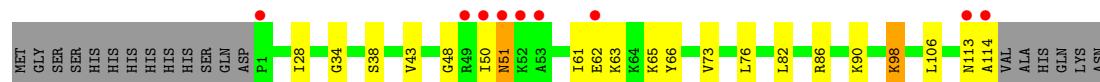
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Chain	Residue	Modelled	Actual	Comment	Reference
G	1	PRO	-	expression tag	UNP Q7A4G9
H	-12	MET	-	expression tag	UNP Q7A4G9
H	-11	GLY	-	expression tag	UNP Q7A4G9
H	-10	SER	-	expression tag	UNP Q7A4G9
H	-9	SER	-	expression tag	UNP Q7A4G9
H	-8	HIS	-	expression tag	UNP Q7A4G9
H	-7	HIS	-	expression tag	UNP Q7A4G9
H	-6	HIS	-	expression tag	UNP Q7A4G9
H	-5	HIS	-	expression tag	UNP Q7A4G9
H	-4	HIS	-	expression tag	UNP Q7A4G9
H	-3	HIS	-	expression tag	UNP Q7A4G9
H	-2	SER	-	expression tag	UNP Q7A4G9
H	-1	GLN	-	expression tag	UNP Q7A4G9
H	0	ASP	-	expression tag	UNP Q7A4G9
H	1	PRO	-	expression tag	UNP Q7A4G9

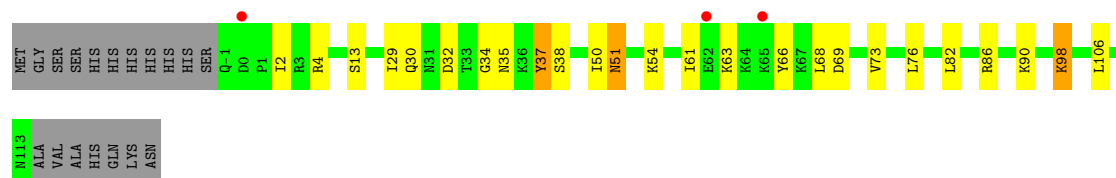
3 Residue-property plots [i](#)

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.

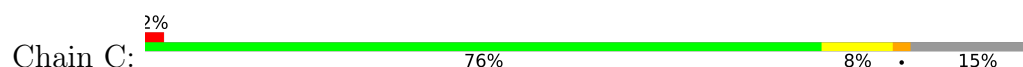
- Molecule 1: MazF mRNA interferase



- Molecule 1: MazF mRNA interferase



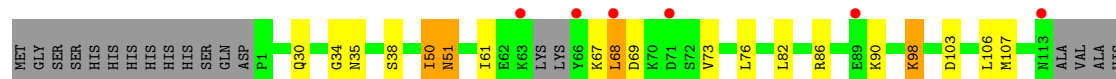
- Molecule 1: MazF mRNA interferase



- Molecule 1: MazF mRNA interferase



- Molecule 1: MazF mRNA interferase



GLN
LYS
ASN

• Molecule 1: MazF mRNA interferase

Chain F: 3% 71% 12% .. 14%

MET GLY SER SER HIS HIS HIS HIS HIS HIS SER SER GLN ASP P1 Y8 L9 G34 Y37 S38 I50 N51 K52 Y66 V73 L76 L82 R86 K90 L91 T92 Y93 L94 L106 N113 A114 VAL ALA HIS GLN LYS ASN

• Molecule 1: MazF mRNA interferase

Chain G: 7% 64% 17% . 15%

MET GLY SER SER HIS HIS HIS HIS HIS HIS SER SER GLN ASP P1 Y8 L9 A10 G17 V23 G34 Y37 S38 R49 I50 N51 K52 A53 I61 E62 K63 K64 K65 Y66 K67 L68 D69 K70 D71 S72 V73 L76 I79 R80 T81 L82 R86 K90 K98

L106 N113 ALA VAL ALA HIS GLN LYS ASN

• Molecule 1: MazF mRNA interferase

Chain H: 2% 74% 11% .. 14%

MET GLY SER SER HIS HIS HIS HIS HIS HIS SER SER GLN ASP P1 R49 I50 N51 I61 E62 K65 K69 K70 D71 S72 V73 L76 I79 L82 R86 K90 K98 L106 N113 A114 VAL ALA HIS GLN LYS ASN

4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	90.88Å 92.64Å 222.38Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	39.20 – 2.70 39.20 – 2.70	Depositor EDS
% Data completeness (in resolution range)	94.4 (39.20-2.70) 97.5 (39.20-2.70)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	0.09	Depositor
$\langle I/\sigma(I) \rangle$	-	Xtriage
Refinement program	PHENIX (phenix.refine: 1.7_650)	Depositor
R, R_{free}	0.208 , 0.243 0.209 , 0.244	Depositor DCC
R_{free} test set	1295 reflections (4.95%)	wwPDB-VP
Wilson B-factor (Å ²)	(Not available)	Xtriage
Anisotropy	(Not available)	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 59.8	EDS
L-test for twinning ¹	$\langle L \rangle =$ (Not available), $\langle L^2 \rangle =$ (Not available)	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	6712	wwPDB-VP
Average B, all atoms (Å ²)	46.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *(Not available)*

¹Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	A	0.57	0/855	0.83	0/1163
1	B	0.58	0/872	0.94	4/1186 (0.3%)
1	C	0.56	0/839	0.90	2/1138 (0.2%)
1	D	0.56	0/836	0.91	2/1136 (0.2%)
1	E	0.58	0/825	0.92	1/1119 (0.1%)
1	F	0.59	0/836	0.84	1/1141 (0.1%)
1	G	0.52	0/850	0.87	2/1153 (0.2%)
1	H	0.55	0/871	0.87	1/1181 (0.1%)
All	All	0.56	0/6784	0.89	13/9217 (0.1%)

There are no bond length outliers.

The worst 5 of 13 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	50	ILE	N-CA-C	6.75	118.63	112.29
1	H	50	ILE	N-CA-C	6.70	118.59	112.29
1	E	50	ILE	N-CA-C	6.59	118.48	112.29
1	D	50	ILE	N-CA-C	6.54	118.44	112.29
1	C	50	ILE	CB-CA-C	-5.89	101.62	111.29

There are no chirality outliers.

There are no planarity outliers.

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	846	0	836	14	0
1	B	860	0	852	14	0
1	C	831	0	814	5	0
1	D	827	0	818	18	0
1	E	818	0	815	12	0
1	F	827	0	802	12	0
1	G	841	0	848	29	0
1	H	862	0	879	13	0
All	All	6712	0	6664	109	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 8.

The worst 5 of 109 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:4:ARG:CA	1:C:4:ARG:CG	2.52	0.87
1:G:65:LYS:HA	1:G:66:TYR:HB2	1.58	0.85
1:A:65:LYS:HA	1:H:65:LYS:HA	1.60	0.82
1:G:50:ILE:O	1:G:51:ASN:CB	2.32	0.78
1:G:62:GLU:C	1:G:64:LYS:H	1.92	0.78

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	112/133 (84%)	106 (95%)	5 (4%)	1 (1%)	14	35
1	B	114/133 (86%)	108 (95%)	6 (5%)	0	100	100
1	C	111/133 (84%)	105 (95%)	5 (4%)	1 (1%)	14	35
1	D	111/133 (84%)	105 (95%)	5 (4%)	1 (1%)	14	35

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	E	107/133 (80%)	101 (94%)	5 (5%)	1 (1%)	14	35
1	F	112/133 (84%)	106 (95%)	5 (4%)	1 (1%)	14	35
1	G	111/133 (84%)	103 (93%)	7 (6%)	1 (1%)	14	35
1	H	112/133 (84%)	108 (96%)	3 (3%)	1 (1%)	14	35
All	All	890/1064 (84%)	842 (95%)	41 (5%)	7 (1%)	16	37

5 of 7 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	51	ASN
1	C	51	ASN
1	F	51	ASN
1	G	51	ASN
1	E	51	ASN

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	87/118 (74%)	84 (97%)	3 (3%)	32	62
1	B	90/118 (76%)	83 (92%)	7 (8%)	11	29
1	C	84/118 (71%)	82 (98%)	2 (2%)	43	72
1	D	83/118 (70%)	80 (96%)	3 (4%)	31	60
1	E	86/118 (73%)	82 (95%)	4 (5%)	23	51
1	F	83/118 (70%)	80 (96%)	3 (4%)	31	60
1	G	88/118 (75%)	82 (93%)	6 (7%)	14	35
1	H	93/118 (79%)	88 (95%)	5 (5%)	20	45
All	All	694/944 (74%)	661 (95%)	33 (5%)	23	50

5 of 33 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	H	51	ASN
1	H	73	VAL
1	H	113	ASN
1	D	73	VAL
1	C	98	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	30	GLN
1	C	30	GLN
1	D	30	GLN
1	E	30	GLN
1	F	30	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides 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 ⓘ

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	114/133 (85%)	0.12	9 (7%) 18 16	23, 40, 93, 113	0
1	B	115/133 (86%)	0.08	3 (2%) 57 54	16, 39, 81, 111	1 (0%)
1	C	113/133 (84%)	-0.07	3 (2%) 56 53	23, 40, 98, 121	0
1	D	113/133 (84%)	-0.03	5 (4%) 39 35	22, 39, 92, 118	0
1	E	111/133 (83%)	0.03	6 (5%) 31 27	24, 39, 98, 112	0
1	F	114/133 (85%)	-0.02	4 (3%) 47 43	23, 40, 96, 114	0
1	G	113/133 (84%)	0.08	9 (7%) 18 15	25, 41, 113, 182	0
1	H	114/133 (85%)	0.04	3 (2%) 57 54	24, 42, 98, 131	0
All	All	907/1064 (85%)	0.03	42 (4%) 37 34	16, 40, 98, 182	1 (0%)

The worst 5 of 42 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	G	113	ASN	5.4
1	A	51	ASN	4.6
1	E	66	TYR	4.3
1	E	68	LEU	3.9
1	C	69	ASP	3.9

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

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

6.3 Carbohydrates ⓘ

There are no oligosaccharides 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.