



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 12, 2026 – 02:33 PM UTC

PDB ID : 3K8Z / pdb_00003k8z
Title : Crystal Structure of Gudb1 a decryptified secondary glutamate dehydrogenase from *B. subtilis*
Authors : Gunka, K.; Newman, J.A.; Commichau, F.M.; Herzberg, C.; Rodrigues, C.; Hewitt, L.; Lewis, R.J.; Stulke, J.
Deposited on : 2009-10-15
Resolution : 2.40 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

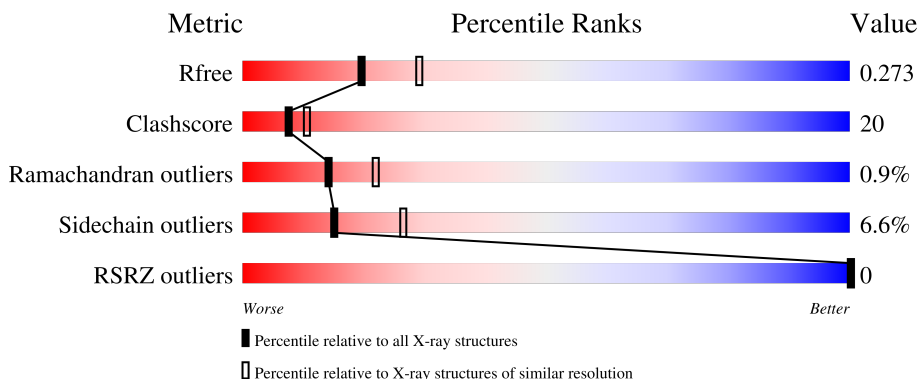
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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	4912 (2.40-2.40)
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (2.40-2.40)

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	423	
1	B	423	
1	C	423	
1	D	423	
1	E	423	

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Mol	Chain	Length	Quality of chain
1	F	423	 A horizontal bar chart showing the quality of the chain. The bar is divided into three segments: green (56%), yellow (34%), and orange (6%). A small grey dot is at the end of the bar. 56%34%6% •

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 18791 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 NAD-specific glutamate dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	378	Total	C	N	O	S	0	0	0
			2929	1856	506	549	18			
1	B	392	Total	C	N	O	S	0	0	0
			3049	1932	525	574	18			
1	C	407	Total	C	N	O	S	0	0	0
			3169	2008	545	598	18			
1	D	378	Total	C	N	O	S	0	0	0
			2929	1856	506	549	18			
1	E	392	Total	C	N	O	S	0	0	0
			3049	1932	525	574	18			
1	F	407	Total	C	N	O	S	0	0	0
			3169	2008	545	598	18			

There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	GLN	SEE REMARK 999	UNP P50735
A	?	-	VAL	SEE REMARK 999	UNP P50735
A	?	-	LYS	SEE REMARK 999	UNP P50735
A	?	-	ALA	SEE REMARK 999	UNP P50735
B	?	-	GLN	SEE REMARK 999	UNP P50735
B	?	-	VAL	SEE REMARK 999	UNP P50735
B	?	-	LYS	SEE REMARK 999	UNP P50735
B	?	-	ALA	SEE REMARK 999	UNP P50735
C	?	-	GLN	SEE REMARK 999	UNP P50735
C	?	-	VAL	SEE REMARK 999	UNP P50735
C	?	-	LYS	SEE REMARK 999	UNP P50735
C	?	-	ALA	SEE REMARK 999	UNP P50735
D	?	-	GLN	SEE REMARK 999	UNP P50735
D	?	-	VAL	SEE REMARK 999	UNP P50735
D	?	-	LYS	SEE REMARK 999	UNP P50735
D	?	-	ALA	SEE REMARK 999	UNP P50735
E	?	-	GLN	SEE REMARK 999	UNP P50735

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Chain	Residue	Modelled	Actual	Comment	Reference
E	?	-	VAL	SEE REMARK 999	UNP P50735
E	?	-	LYS	SEE REMARK 999	UNP P50735
E	?	-	ALA	SEE REMARK 999	UNP P50735
F	?	-	GLN	SEE REMARK 999	UNP P50735
F	?	-	VAL	SEE REMARK 999	UNP P50735
F	?	-	LYS	SEE REMARK 999	UNP P50735
F	?	-	ALA	SEE REMARK 999	UNP P50735

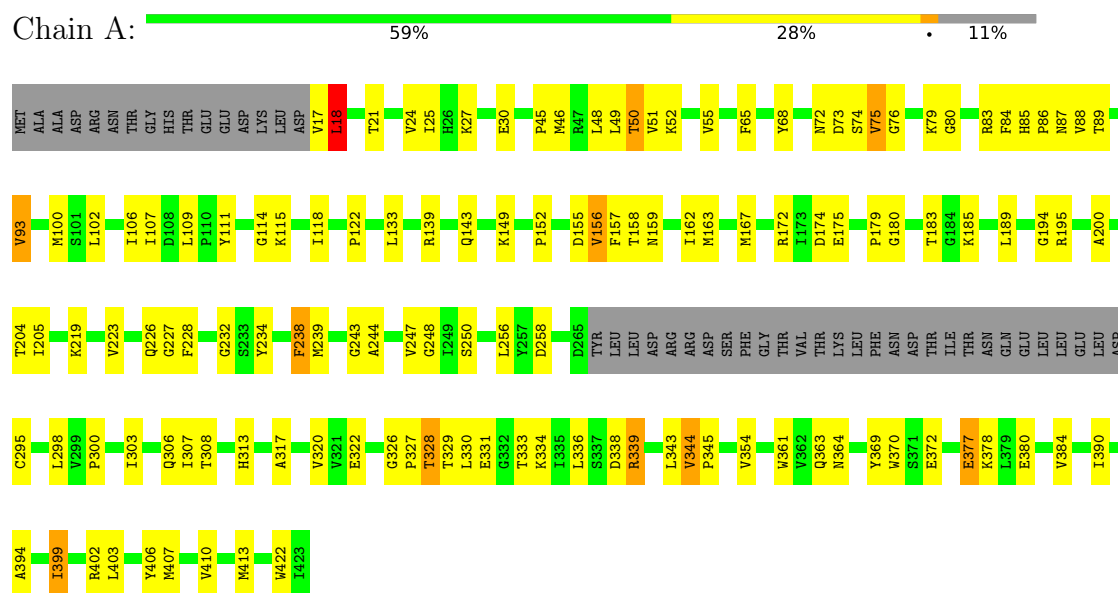
- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	85	Total O 85 85	0	0
2	B	66	Total O 66 66	0	0
2	C	88	Total O 88 88	0	0
2	D	73	Total O 73 73	0	0
2	E	84	Total O 84 84	0	0
2	F	101	Total O 101 101	0	0

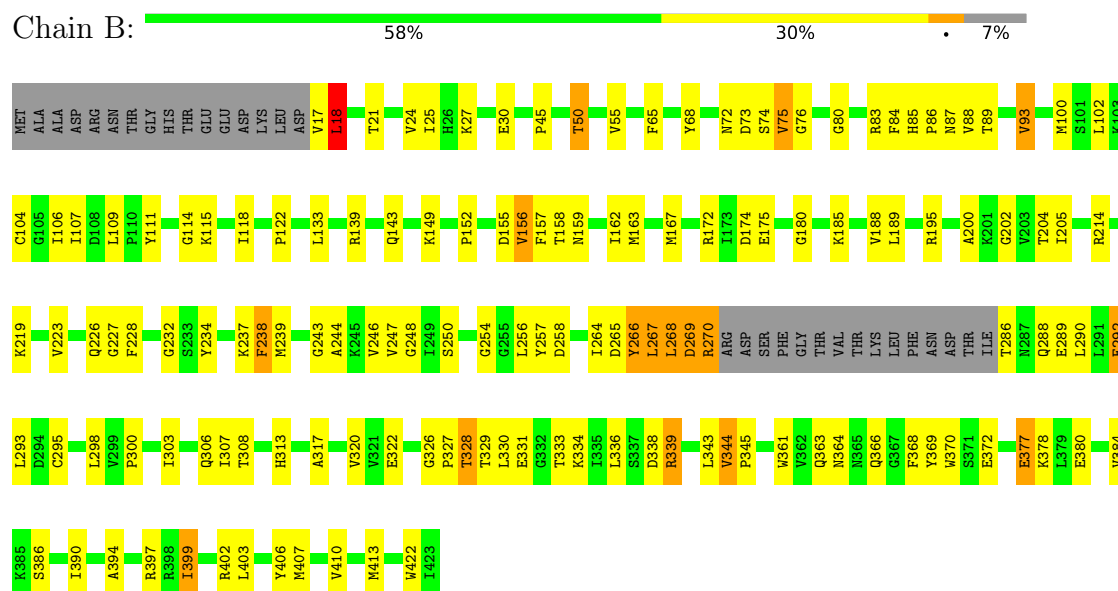
3 Residue-property plots

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.

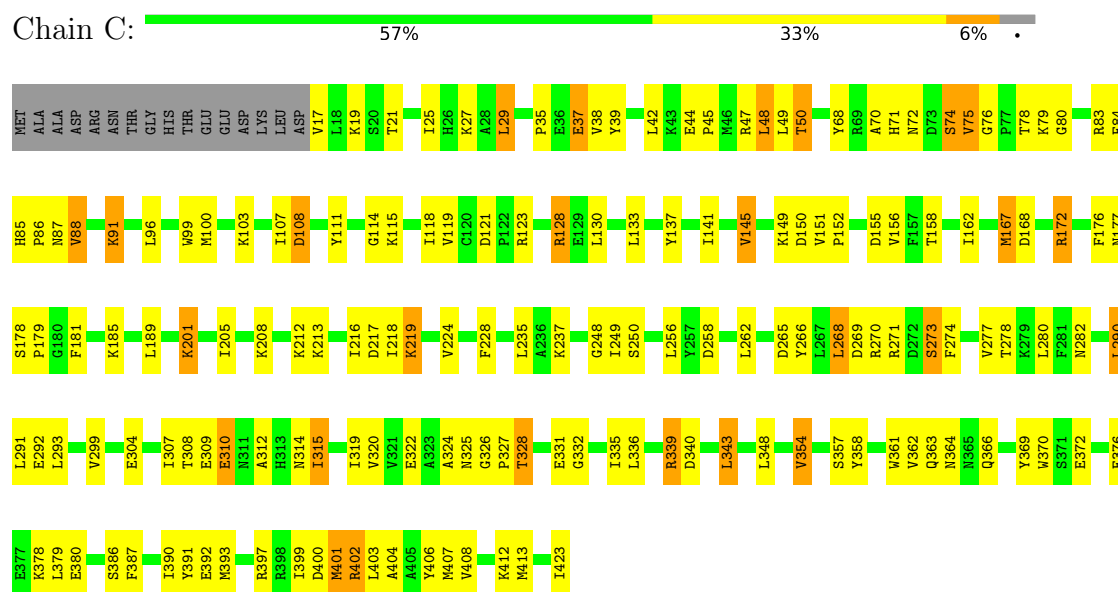
- Molecule 1: NAD-specific glutamate dehydrogenase



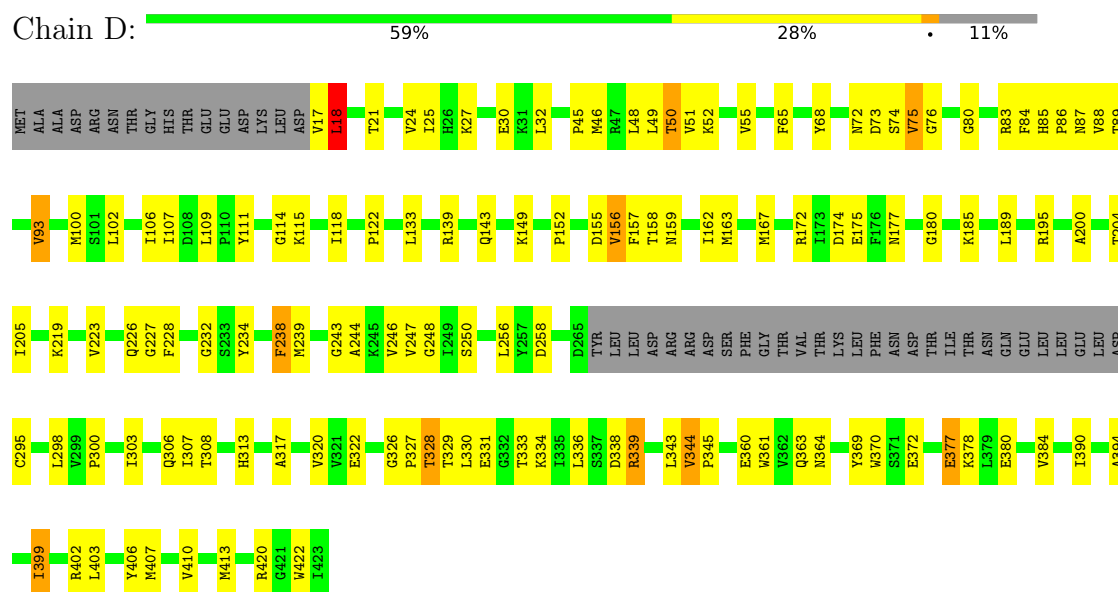
- Molecule 1: NAD-specific glutamate dehydrogenase



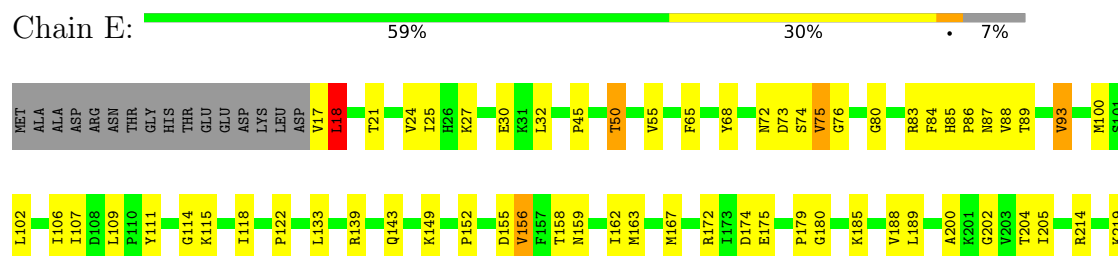
• Molecule 1: NAD-specific glutamate dehydrogenase

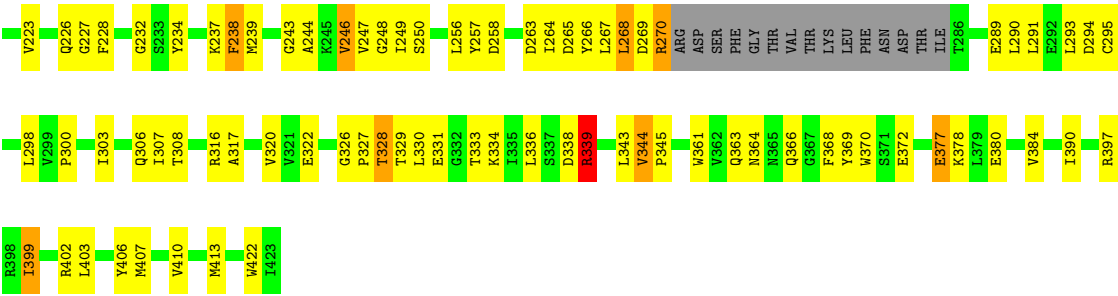


• Molecule 1: NAD-specific glutamate dehydrogenase

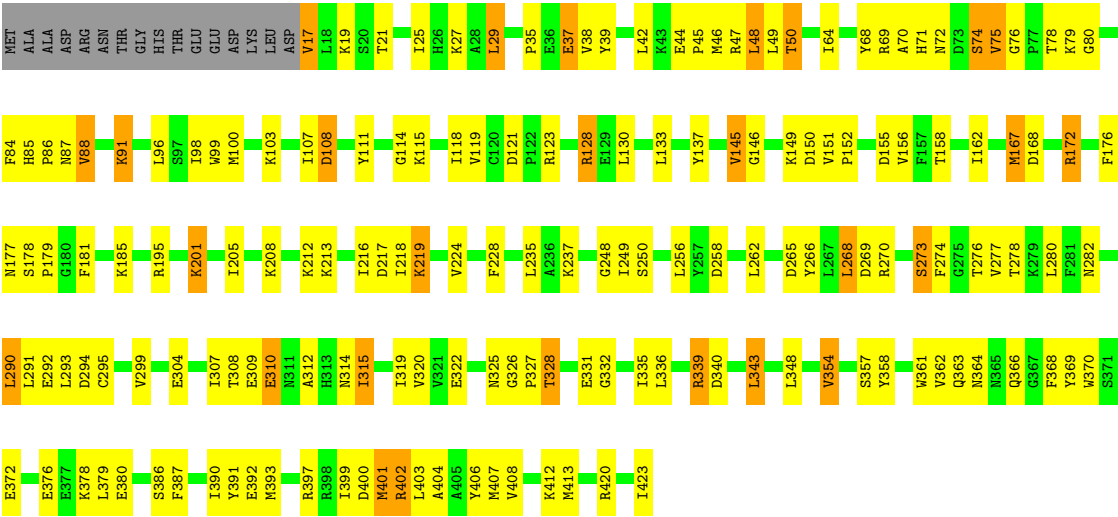


• Molecule 1: NAD-specific glutamate dehydrogenase





● Molecule 1: NAD-specific glutamate dehydrogenase



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	85.22Å 192.49Å 89.39Å 90.00° 118.74° 90.00°	Depositor
Resolution (Å)	19.77 – 2.40 19.77 – 2.40	Depositor EDS
% Data completeness (in resolution range)	97.9 (19.77-2.40) 96.6 (19.77-2.40)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.64 (at 2.41Å)	Xtriage
Refinement program	PHENIX 1.5_2	Depositor
R, R_{free}	0.247 , 0.278 0.243 , 0.273	Depositor DCC
R_{free} test set	4788 reflections (4.88%)	wwPDB-VP
Wilson B-factor (Å ²)	39.1	Xtriage
Anisotropy	0.389	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 23.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.43$, $\langle L^2 \rangle = 0.26$	Xtriage
Estimated twinning fraction	0.367 for h,-k,-h-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	18791	wwPDB-VP
Average B, all atoms (Å ²)	45.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.65% of the height of the origin peak. No significant pseudotranslation is detected.*

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](#)

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	0/2984	0.78	3/4025 (0.1%)
1	B	0.34	0/3105	0.79	3/4191 (0.1%)
1	C	0.30	0/3228	0.78	0/4359
1	D	0.29	0/2984	0.78	3/4025 (0.1%)
1	E	0.36	0/3105	0.84	7/4191 (0.2%)
1	F	0.30	0/3228	0.78	0/4359
All	All	0.32	0/18634	0.79	16/25150 (0.1%)

There are no bond length outliers.

The worst 5 of 16 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	339	ARG	NE-CZ-NH2	11.24	129.32	119.20
1	E	339	ARG	NE-CZ-NH1	-10.67	110.83	121.50
1	D	18	LEU	N-CA-C	-9.69	101.97	113.88
1	A	18	LEU	N-CA-C	-9.42	102.30	113.88
1	E	18	LEU	N-CA-C	-9.15	102.63	113.88

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	2929	0	2946	107	0
1	B	3049	0	3064	127	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	C	3169	0	3183	155	0
1	D	2929	0	2946	107	0
1	E	3049	0	3064	121	0
1	F	3169	0	3183	162	0
2	A	85	0	0	8	0
2	B	66	0	0	4	0
2	C	88	0	0	10	0
2	D	73	0	0	8	0
2	E	84	0	0	3	0
2	F	101	0	0	9	0
All	All	18791	0	18386	740	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 20.

The worst 5 of 740 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:264:ILE:O	1:B:268:LEU:HB2	1.50	1.11
1:B:270:ARG:HH11	1:B:270:ARG:HG2	0.86	1.03
1:B:270:ARG:HH11	1:B:270:ARG:CG	1.73	0.97
1:B:270:ARG:HG2	1:B:270:ARG:NH1	1.65	0.96
1:F:44:GLU:HG3	1:F:45:PRO:HD2	1.50	0.93

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	374/423 (88%)	353 (94%)	19 (5%)	2 (0%)	24 37
1	B	388/423 (92%)	365 (94%)	17 (4%)	6 (2%)	8 12

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	405/423 (96%)	376 (93%)	25 (6%)	4 (1%)	12	20
1	D	374/423 (88%)	353 (94%)	18 (5%)	3 (1%)	16	25
1	E	388/423 (92%)	366 (94%)	19 (5%)	3 (1%)	16	25
1	F	405/423 (96%)	376 (93%)	25 (6%)	4 (1%)	12	20
All	All	2334/2538 (92%)	2189 (94%)	123 (5%)	22 (1%)	14	22

5 of 22 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	156	VAL
1	B	156	VAL
1	B	266	TYR
1	B	267	LEU
1	B	269	ASP

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	312/353 (88%)	300 (96%)	12 (4%)	29	49
1	B	326/353 (92%)	310 (95%)	16 (5%)	22	39
1	C	340/353 (96%)	304 (89%)	36 (11%)	6	10
1	D	312/353 (88%)	299 (96%)	13 (4%)	26	45
1	E	326/353 (92%)	311 (95%)	15 (5%)	24	41
1	F	340/353 (96%)	303 (89%)	37 (11%)	6	9
All	All	1956/2118 (92%)	1827 (93%)	129 (7%)	15	26

5 of 129 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	F	304	GLU
1	F	320	VAL

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Mol	Chain	Res	Type
1	C	282	ASN
1	C	278	THR
1	F	339	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 53 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	143	GLN
1	E	143	GLN
1	F	325	ASN
1	D	193	HIS
1	D	363	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 [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, 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	378/423 (89%)	-1.35	0 100 100	26, 43, 77, 92	0
1	B	392/423 (92%)	-1.36	0 100 100	27, 43, 77, 92	0
1	C	407/423 (96%)	-1.43	0 100 100	24, 39, 59, 74	0
1	D	378/423 (89%)	-1.34	0 100 100	27, 43, 77, 93	0
1	E	392/423 (92%)	-1.37	0 100 100	26, 43, 77, 92	0
1	F	407/423 (96%)	-1.44	0 100 100	23, 39, 59, 74	0
All	All	2354/2538 (92%)	-1.38	0 100 100	23, 42, 75, 93	0

There are no RSRZ outliers to report.

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](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.