



wwPDB X-ray Structure Validation Summary Report ⓘ

May 23, 2020 – 02:30 am BST

PDB ID : 3CB4
Title : The Crystal Structure of LepA
Authors : Evans, R.N.; Blaha, G.; Bailey, S.; Steitz, T.A.
Deposited on : 2008-02-21
Resolution : 2.80 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Xtriage (Phenix) : 1.13
EDS : 2.11
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.11

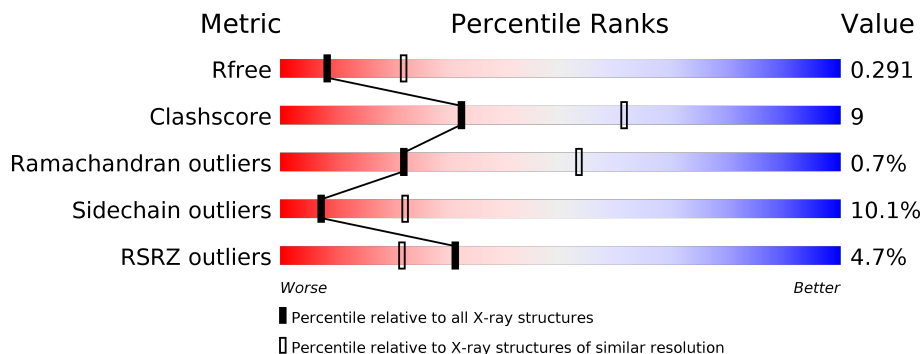
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	3140 (2.80-2.80)
Clashscore	141614	3569 (2.80-2.80)
Ramachandran outliers	138981	3498 (2.80-2.80)
Sidechain outliers	138945	3500 (2.80-2.80)
RSRZ outliers	127900	3078 (2.80-2.80)

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 on 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	599	 2% 67% 17% • 12%
1	B	599	 3% 65% 19% • 12%
1	C	599	 6% 64% 20% • 12%
1	D	599	 5% 67% 18% • 12%
1	E	599	 7% 67% 19% • 12%
1	F	599	 3% 64% 22% • 12%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 24495 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 GTP-binding protein lepA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	D	525	4082	2579	698	785	20	0	0	0
1	A	525	4082	2579	698	785	20	0	0	0
1	B	525	4082	2579	698	785	20	0	0	0
1	C	525	4082	2579	698	785	20	0	0	0
1	E	525	4082	2579	698	785	20	0	0	0
1	F	525	4082	2579	698	785	20	0	0	0

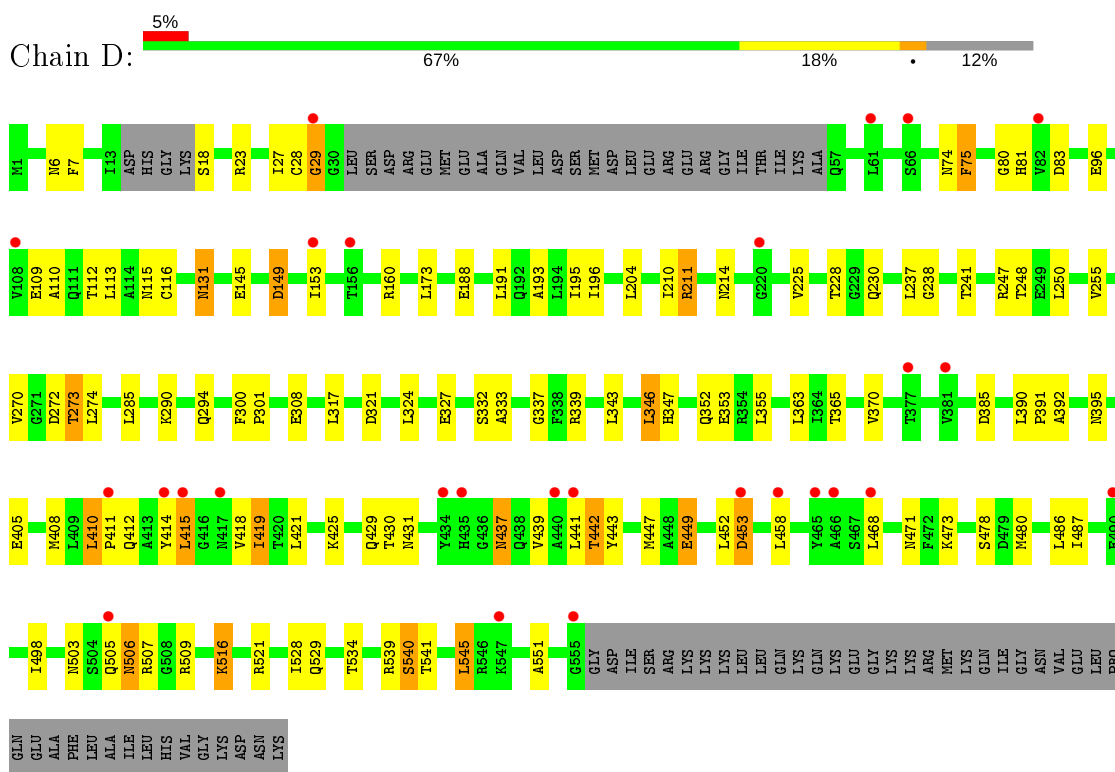
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	D	3	Total	O	0	0
			3	3		

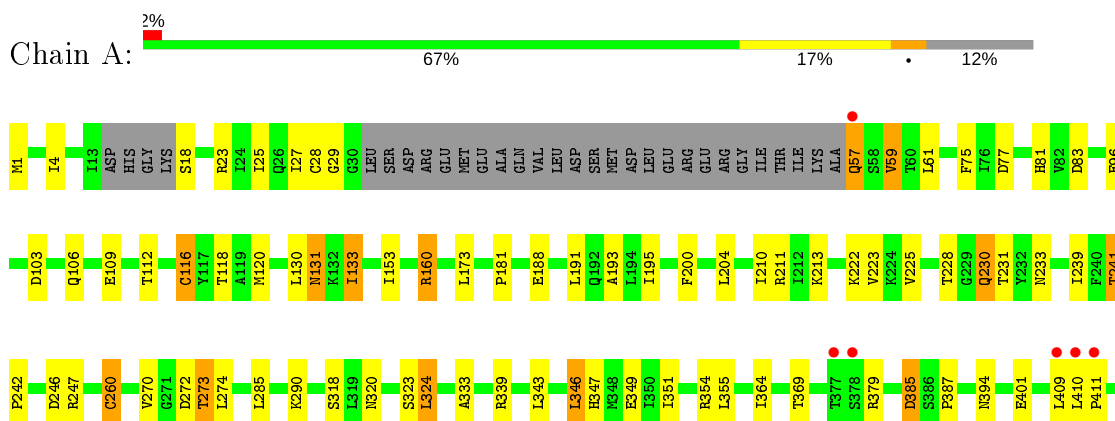
3 Residue-property plots [i](#)

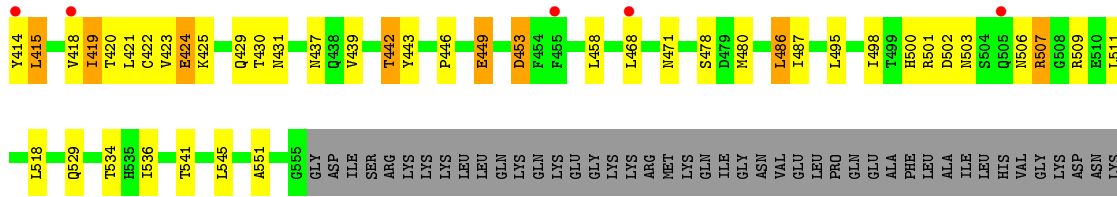
These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are 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: GTP-binding protein lepA

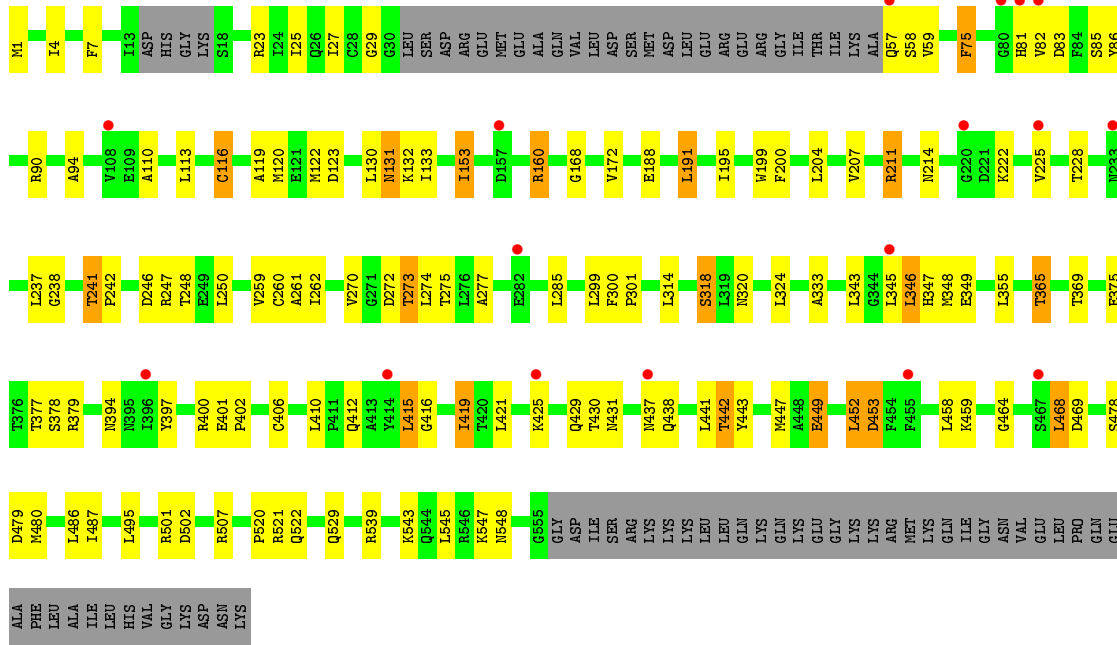


- Molecule 1: GTP-binding protein lepA

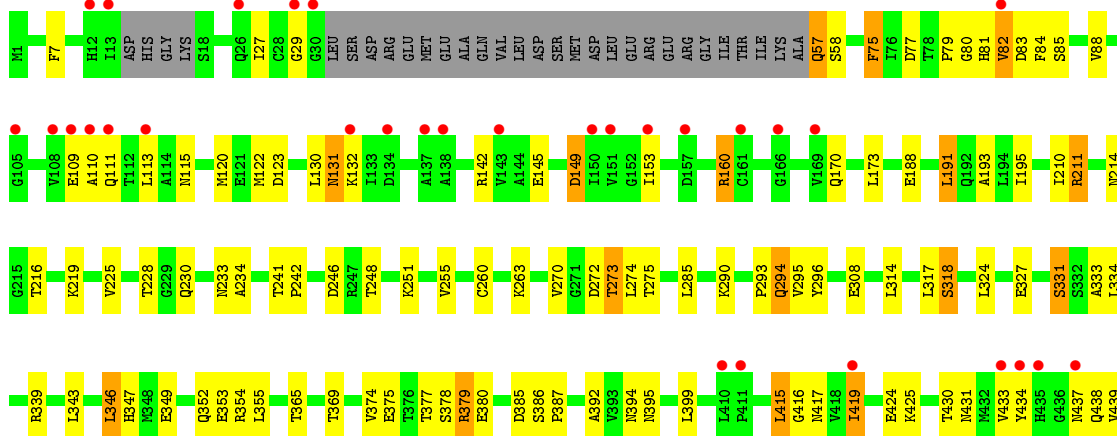


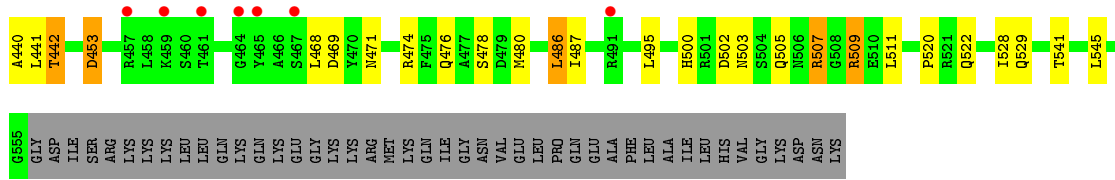


• Molecule 1: GTP-binding protein lepA

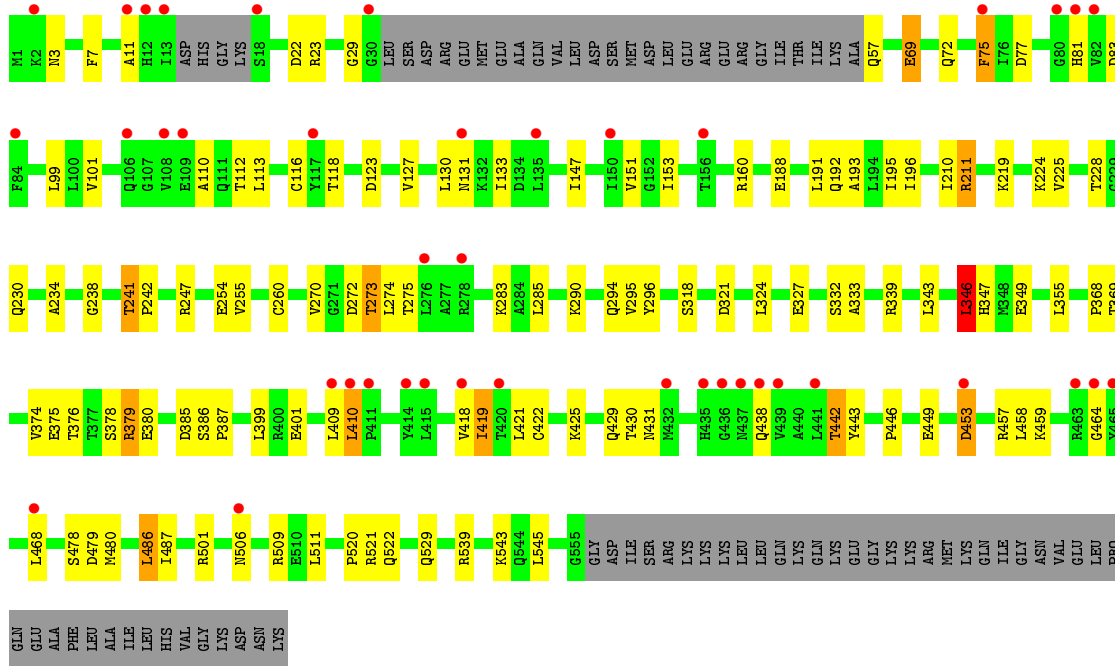


• Molecule 1: GTP-binding protein lepA

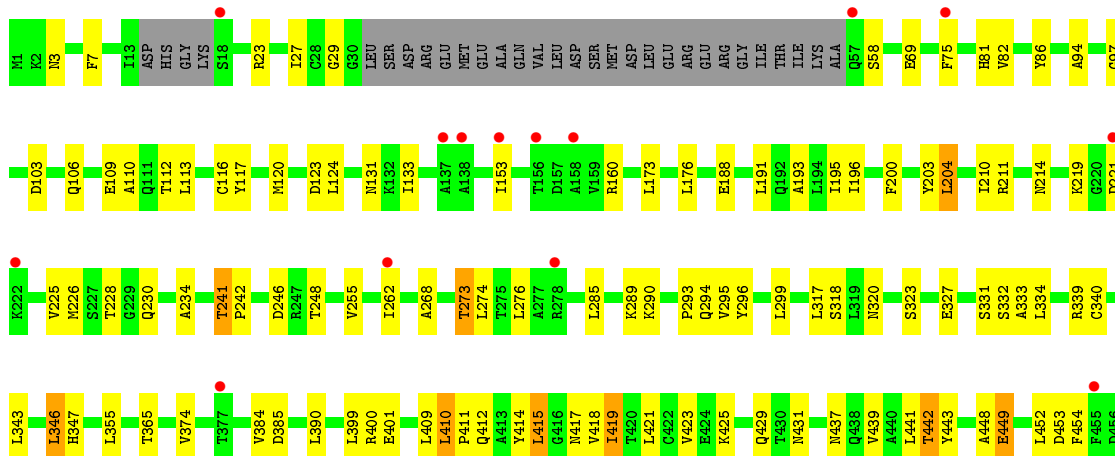




• Molecule 1: GTP-binding protein lepA



• Molecule 1: GTP-binding protein lepA



R457	LYS	L488	GLN	K459	LYS	T461	GLY	A466	LYS	S467	ARG	L468	LYS	F475	LYS	A476	ILE	A477	GLY	S478	ASN	D479	VAL	M480	GLU	L486	LEU	I487	GLN	L495	GLU	L495	ALA	R501	PHE	D502	ALA	N503	ILE	M506	LEU	R507	HIS	N507	VAL	L511	GLY	K516	ASP	ASN	L519	LYS	P520	LYS	R521	LYS	Q522	GLN	Q529	LYS	I537	LYS	A538	GLY	R539	LYS	S540	VAL	T541	GLY	L545	LYS	G555	GLY	G555	GLY	ASP	ILE	SER	ARG	ARG	LYS	LYS	LYS	LEU	LEU	LEU	GLN
------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	97.96Å 146.24Å 139.32Å 90.00° 100.60° 90.00°	Depositor
Resolution (Å)	50.00 – 2.80 43.31 – 2.81	Depositor EDS
% Data completeness (in resolution range)	95.4 (50.00-2.80) 94.6 (43.31-2.81)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	0.09	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.93 (at 2.81Å)	Xtrriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.246 , 0.295 0.242 , 0.291	Depositor DCC
R_{free} test set	4590 reflections (5.18%)	wwPDB-VP
Wilson B-factor (Å ²)	53.0	Xtrriage
Anisotropy	0.065	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 44.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	24495	wwPDB-VP
Average B, all atoms (Å ²)	54.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.48% of the height of the origin peak. No significant pseudotranslation is detected.*

¹ Intensities estimated from amplitudes.

² 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 [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	0.35	0/4150	0.56	0/5626
1	B	0.35	0/4150	0.56	0/5626
1	C	0.38	2/4150 (0.0%)	0.59	2/5626 (0.0%)
1	D	0.34	0/4150	0.56	0/5626
1	E	0.34	0/4150	0.55	1/5626 (0.0%)
1	F	0.35	0/4150	0.55	0/5626
All	All	0.35	2/24900 (0.0%)	0.56	3/33756 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	142	ARG	NE-CZ	6.50	1.41	1.33
1	C	142	ARG	CZ-NH1	5.67	1.40	1.33

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	142	ARG	NE-CZ-NH1	12.29	126.44	120.30
1	C	142	ARG	NE-CZ-NH2	-7.74	116.43	120.30
1	E	346	LEU	CA-CB-CG	5.31	127.52	115.30

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	4082	0	4095	75	0
1	B	4082	0	4095	72	0
1	C	4082	0	4095	76	0
1	D	4082	0	4095	68	0
1	E	4082	0	4095	68	0
1	F	4082	0	4095	85	0
2	D	3	0	0	0	0
All	All	24495	0	24570	430	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 9.

The worst 5 of 430 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:419:ILE:HD11	1:F:419:ILE:HD11	1.27	1.16
1:D:23:ARG:HH22	1:D:131:ASN:HD21	1.06	1.00
1:F:23:ARG:HH22	1:F:131:ASN:HD21	1.03	0.99
1:E:273:THR:HG21	1:E:285:LEU:H	1.34	0.93
1:C:273:THR:HG21	1:C:285:LEU:H	1.37	0.89

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	519/599 (87%)	501 (96%)	15 (3%)	3 (1%)	25 56
1	B	519/599 (87%)	494 (95%)	20 (4%)	5 (1%)	15 44
1	C	519/599 (87%)	495 (95%)	20 (4%)	4 (1%)	19 49
1	D	519/599 (87%)	490 (94%)	27 (5%)	2 (0%)	34 66
1	E	519/599 (87%)	492 (95%)	22 (4%)	5 (1%)	15 44

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	F	519/599 (87%)	495 (95%)	21 (4%)	3 (1%)	25	56
All	All	3114/3594 (87%)	2967 (95%)	125 (4%)	22 (1%)	22	53

5 of 22 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	453	ASP
1	C	379	ARG
1	E	379	ARG
1	D	29	GLY
1	D	453	ASP

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	447/511 (88%)	393 (88%)	54 (12%)	5	15
1	B	447/511 (88%)	402 (90%)	45 (10%)	7	22
1	C	447/511 (88%)	398 (89%)	49 (11%)	6	19
1	D	447/511 (88%)	401 (90%)	46 (10%)	7	21
1	E	447/511 (88%)	413 (92%)	34 (8%)	13	36
1	F	447/511 (88%)	403 (90%)	44 (10%)	8	24
All	All	2682/3066 (88%)	2410 (90%)	272 (10%)	7	22

5 of 272 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	365	THR
1	C	131	ASN
1	F	410	LEU
1	B	401	GLU
1	B	458	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 62 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	438	GLN
1	C	266	HIS
1	F	347	HIS
1	C	115	ASN
1	C	347	HIS

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 carbohydrates 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	525/599 (87%)	0.31	11 (2%) 63 54	46, 53, 59, 62	0
1	B	525/599 (87%)	0.36	17 (3%) 47 37	46, 53, 60, 66	0
1	C	525/599 (87%)	0.51	38 (7%) 15 8	48, 54, 61, 65	0
1	D	525/599 (87%)	0.45	27 (5%) 28 19	47, 54, 59, 63	0
1	E	525/599 (87%)	0.53	41 (7%) 13 7	46, 54, 60, 63	0
1	F	525/599 (87%)	0.38	15 (2%) 51 41	46, 54, 59, 61	0
All	All	3150/3594 (87%)	0.42	149 (4%) 31 22	46, 54, 60, 66	0

The worst 5 of 149 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	411	PRO	6.2
1	E	463	ARG	5.2
1	D	440	ALA	5.0
1	E	409	LEU	4.9
1	D	414	TYR	4.8

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 carbohydrates in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers

There are no such residues in this entry.