wwPDB X-ray Structure Validation Summary Report (i)

Jun 17, 2024 – 04:55 AM EDT

PDB ID	:	3CB4
Title	:	The Crystal Structure of LepA
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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 (i) 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 (i)) were used in the production of this report:

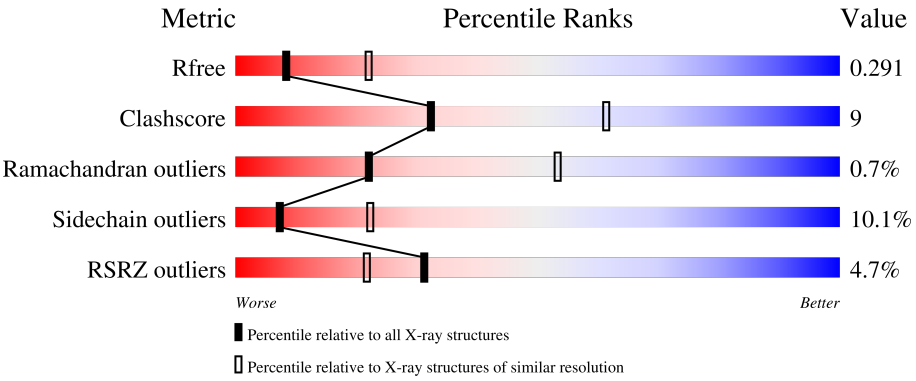
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.20.1
EDS	:	2.37.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

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 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 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 <=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%

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Mol	Chain	Length	Quality of chain
1	F	599	

2 Entry composition (i)

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
1	D	525	Total	C	N	O	S	0	0	0
			4082	2579	698	785	20			
1	A	525	Total	C	N	O	S	0	0	0
			4082	2579	698	785	20			
1	B	525	Total	C	N	O	S	0	0	0
			4082	2579	698	785	20			
1	C	525	Total	C	N	O	S	0	0	0
			4082	2579	698	785	20			
1	E	525	Total	C	N	O	S	0	0	0
			4082	2579	698	785	20			
1	F	525	Total	C	N	O	S	0	0	0
			4082	2579	698	785	20			

- Molecule 2 is water.

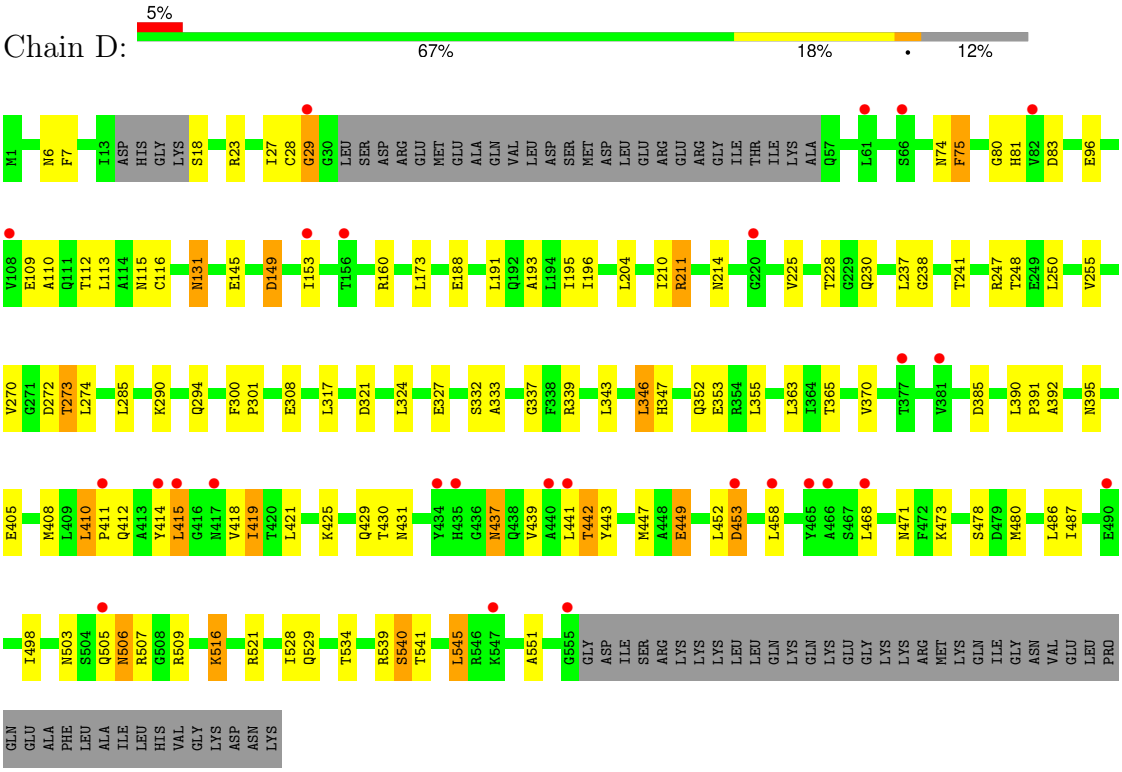
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	D	3	Total	O	0	0
			3	3		

3 Residue-property plots (i)

These plots are drawn for all protein, RNA, 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.

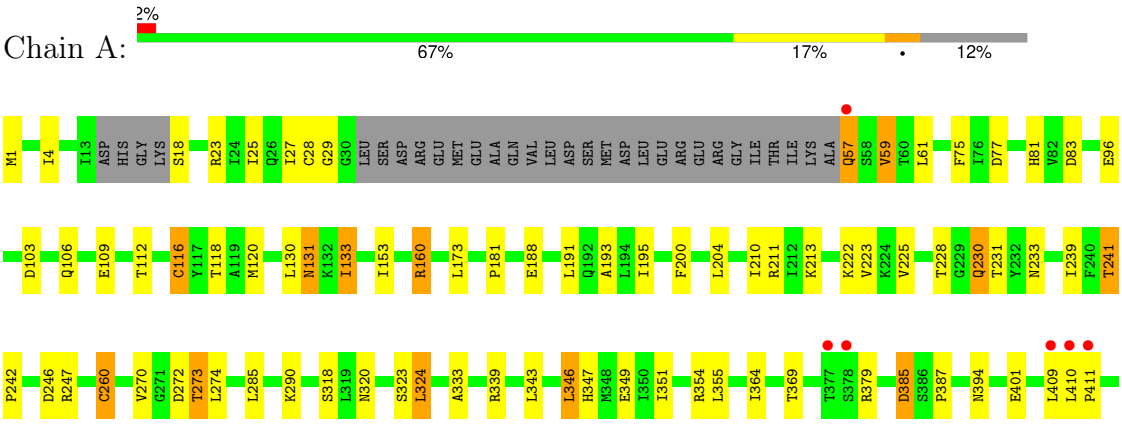
• Molecule 1: GTP-binding protein lepA

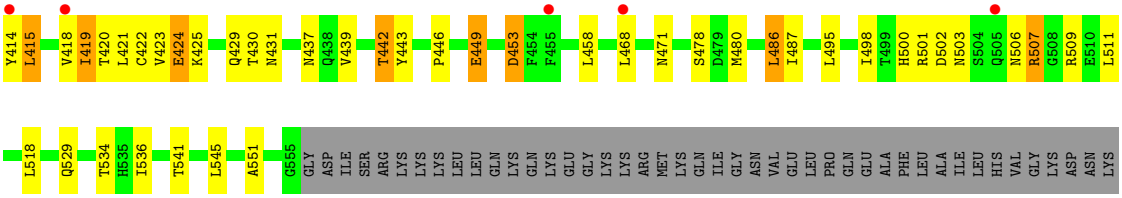
Chain D:



• Molecule 1: GTP-binding protein lepA

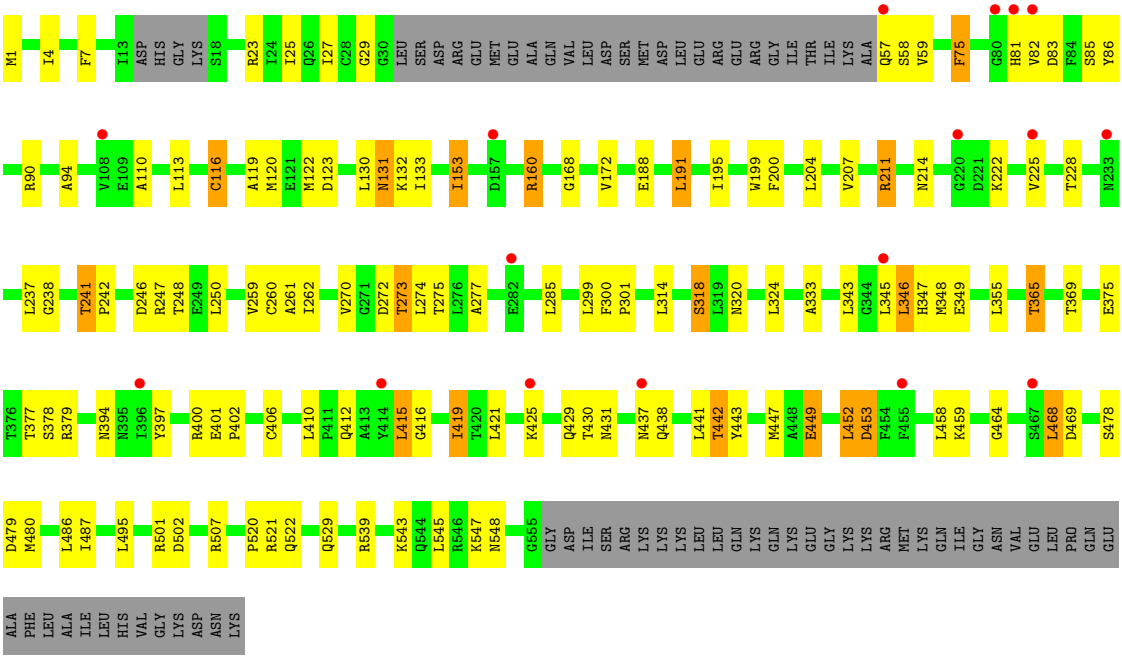
Chain A:





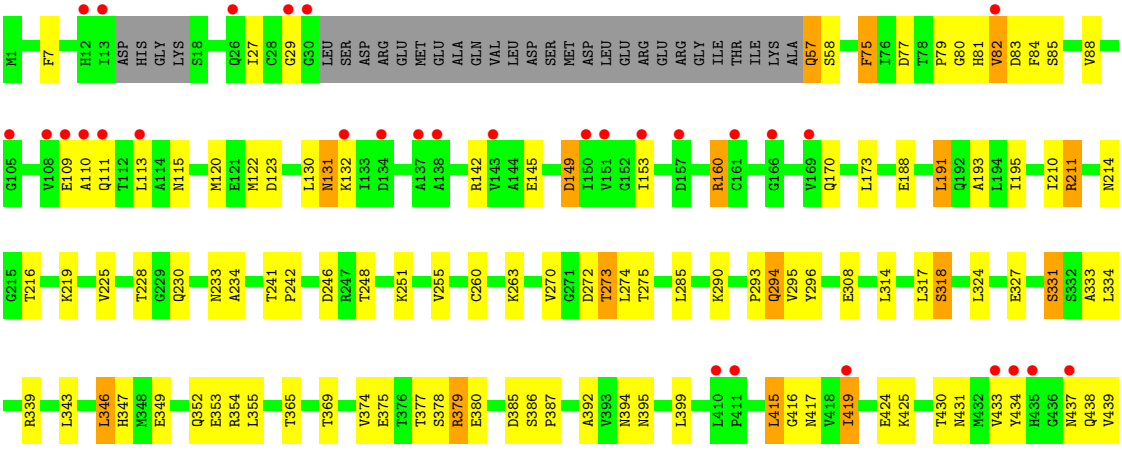
• Molecule 1: GTP-binding protein lepA

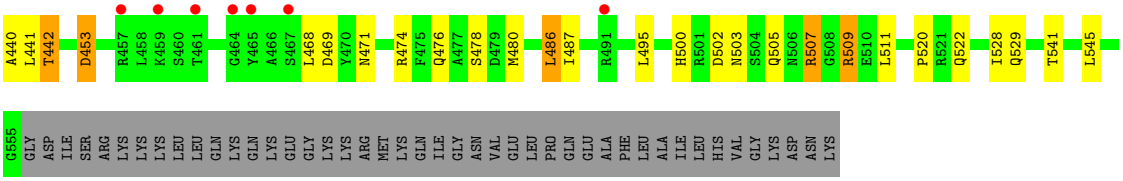
Chain B:



• Molecule 1: GTP-binding protein lepA

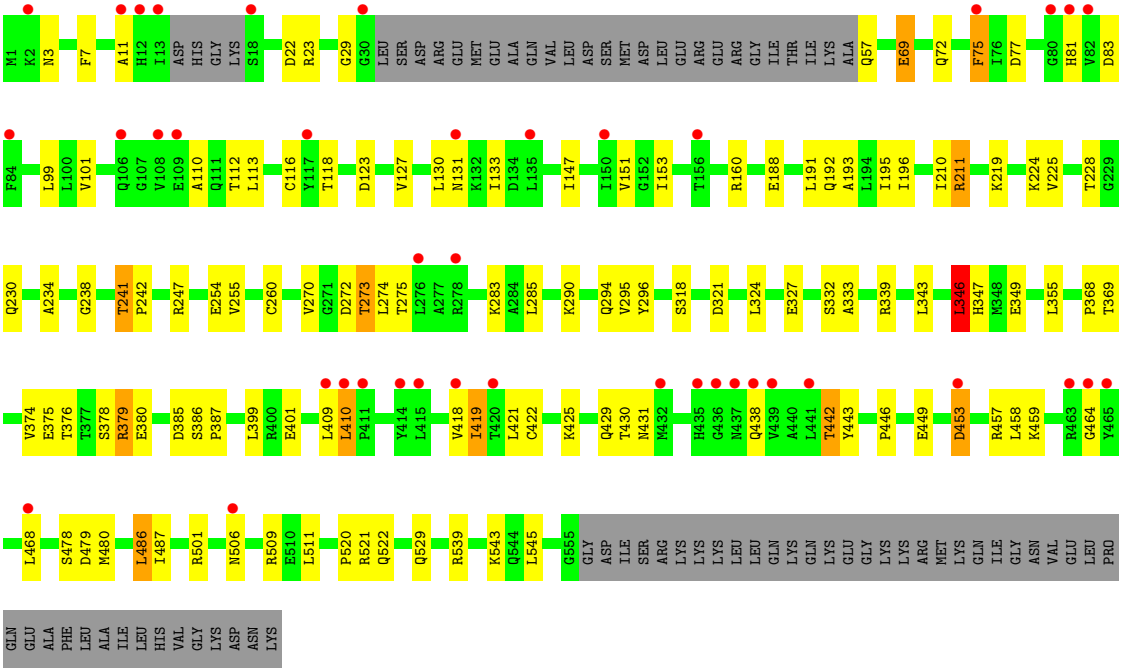
Chain C:





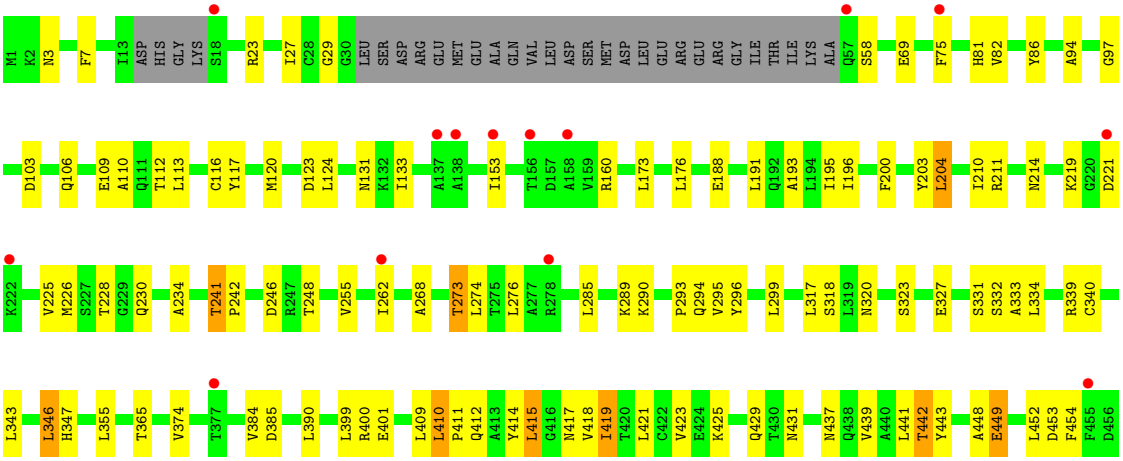
• Molecule 1: GTP-binding protein lepA

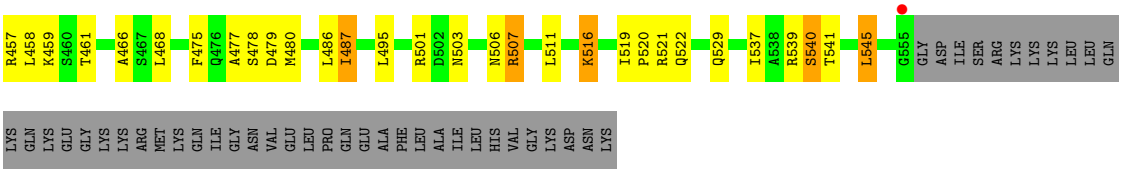
Chain E:



• Molecule 1: GTP-binding protein lepA

Chain F:




R457 L458 K459 S460 T461 A466 S467 L468 F475 Q476 A477 S478 D479 M480 L486 I487 L495 R501 D502 N503 N506 R507 L511 K516 I519 P520 R521 Q522 Q529 I537 A538 R539 S540 T541 L545 G555 GLY ASP ILE SER ARG LYS LYS LEU LEU GLN
LYS GLN LYS GLU GLY LYS LYS ARG MET LYS GLN ILE GLY ASN VAL GLU LEU PRO GLN GLU ALA PHE LEU ALA ILE LEU HIS VAL GLY LYS ASP ASN LYS

4 Data and refinement statistics (i)

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
$< I/\sigma(I) >$ [1]	1.93 (at 2.81Å)	Xtriage
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	Xtriage
Anisotropy	0.065	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.29 , 44.8	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
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

Xtriage'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 $< |L| >$, $< L^2 >$ 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

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(^{o})	Ideal(^{o})
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

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

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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	F	123	ASP
1	F	230	GLN
1	F	459	LYS
1	A	534	THR
1	A	507	ARG

Sometimes 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	F	131	ASN
1	C	320	ASN
1	F	81	HIS
1	F	429	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 monosaccharides 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, 95^{th} 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

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

6.3 Carbohydrates

There are no monosaccharides in this entry.

6.4 Ligands

There are no ligands in this entry.

6.5 Other polymers (i)

There are no such residues in this entry.