



Full wwPDB X-ray Structure Validation Report ⓘ

Jul 20, 2019 – 08:01 PM EDT

PDB ID : 6K3A
Title : Crystal structure of human PCNA in complex with DNMT1 PIP box motif.
Authors : Jimenji, T.; Kori, S.; Arita, K.
Deposited on : 2019-05-17
Resolution : 2.30 Å(reported)

This is a Full wwPDB X-ray Structure Validation 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 : 2.3.2
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)
Refmac : 5.8.0158
CCP4 : 7.0 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.3.2

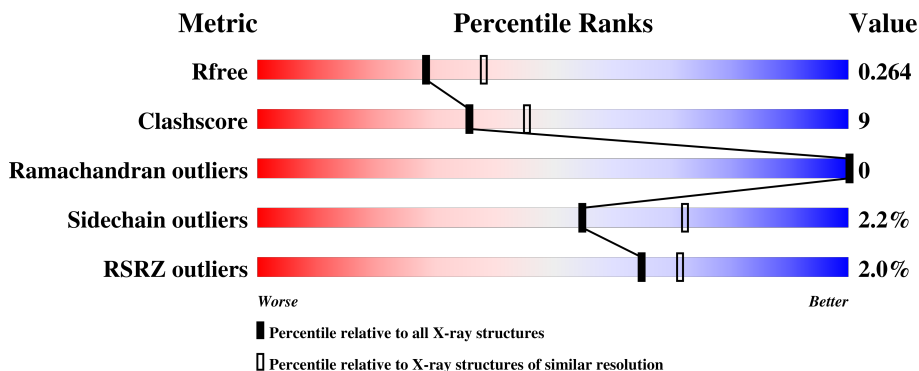
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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}	111664	4477 (2.30-2.30)
Clashscore	122126	5072 (2.30-2.30)
Ramachandran outliers	120053	5022 (2.30-2.30)
Sidechain outliers	120020	5021 (2.30-2.30)
RSRZ outliers	108989	4374 (2.30-2.30)

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. 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	264	 3% 72% 18% 9%
1	C	264	 % 70% 22% 9%
1	E	264	 2% 72% 18% 9%
2	B	20	 65% 35%
2	D	20	 5% 60% 5% 30%

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Mol	Chain	Length	Quality of chain
2	F	20	 60% 5% 35%

2 Entry composition i

There are 3 unique types of molecules in this entry. The entry contains 5671 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 Proliferating cell nuclear antigen.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	241	1776	1140	287	334	15	0	0	0
1	C	241	1784	1143	288	338	15	0	0	0
1	E	241	1772	1137	284	335	16	0	0	0

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	GLY	-	expression tag	UNP P12004
A	-1	PRO	-	expression tag	UNP P12004
A	0	GLY	-	expression tag	UNP P12004
C	-2	GLY	-	expression tag	UNP P12004
C	-1	PRO	-	expression tag	UNP P12004
C	0	GLY	-	expression tag	UNP P12004
E	-2	GLY	-	expression tag	UNP P12004
E	-1	PRO	-	expression tag	UNP P12004
E	0	GLY	-	expression tag	UNP P12004

- Molecule 2 is a protein called Peptide from DNA (cytosine-5)-methyltransferase 1.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	B	13	98	60	19	19	0	0	0
2	D	13	98	60	19	19	0	0	0
2	F	13	97	59	19	19	0	0	0

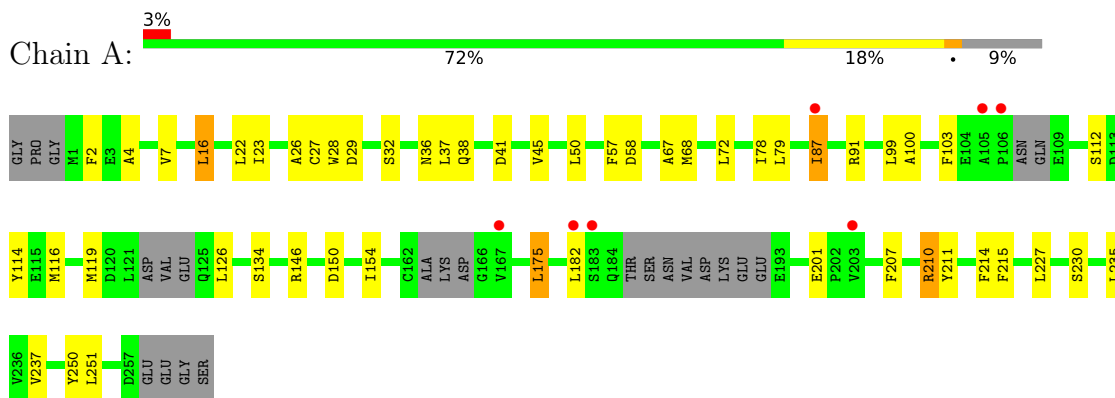
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	6	Total O 6 6	0	0
3	B	2	Total O 2 2	0	0
3	C	14	Total O 14 14	0	0
3	D	3	Total O 3 3	0	0
3	E	19	Total O 19 19	0	0
3	F	2	Total O 2 2	0	0

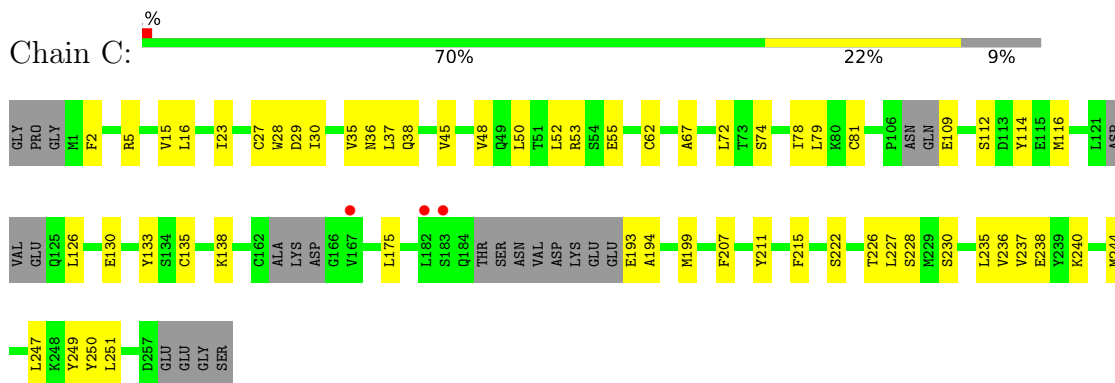
3 Residue-property plots [i](#)

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.

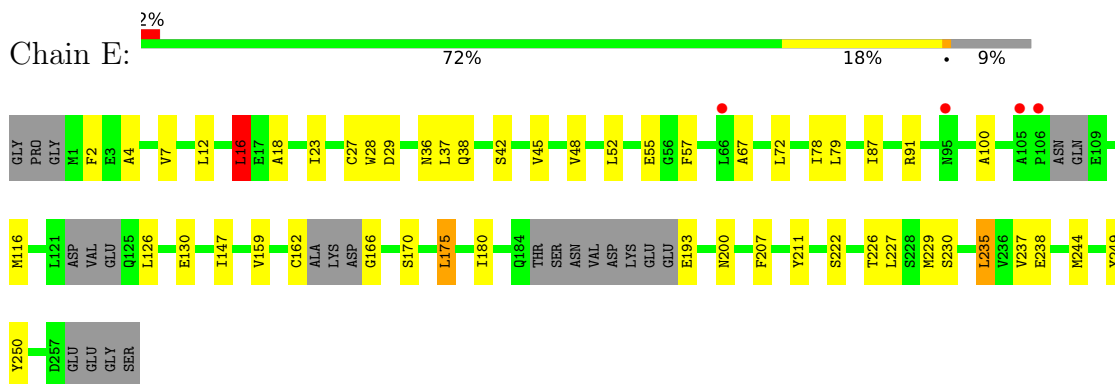
- Molecule 1: Proliferating cell nuclear antigen



- Molecule 1: Proliferating cell nuclear antigen

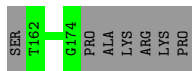


- Molecule 1: Proliferating cell nuclear antigen



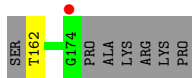
- Molecule 2: Peptide from DNA (cytosine-5)-methyltransferase 1

Chain B:  65% 35%



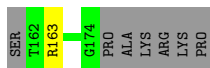
- Molecule 2: Peptide from DNA (cytosine-5)-methyltransferase 1

Chain D:  5% 60% 5% 35%



- Molecule 2: Peptide from DNA (cytosine-5)-methyltransferase 1

Chain F:  60% 5% 35%



4 Data and refinement statistics i

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	141.54Å 81.60Å 68.11Å 90.00° 90.02° 90.00°	Depositor
Resolution (Å)	40.84 – 2.30 40.84 – 2.30	Depositor EDS
% Data completeness (in resolution range)	99.3 (40.84-2.30) 99.0 (40.84-2.30)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.52 (at 2.29Å)	Xtriage
Refinement program	PHENIX (1.15.2_3472: ???)	Depositor
R, R_{free}	0.217 , 0.264 0.217 , 0.264	Depositor DCC
R_{free} test set	1791 reflections (5.20%)	wwPDB-VP
Wilson B-factor (Å ²)	54.6	Xtriage
Anisotropy	0.090	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 39.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.35$	Xtriage
Estimated twinning fraction	0.039 for -1/2*h-3/2*k,-1/2*h+1/2*k,-l 0.037 for -1/2*h+3/2*k,1/2*h+1/2*k,-l 0.477 for 1/2*h-3/2*k,-1/2*h-1/2*k,-l 0.478 for 1/2*h+3/2*k,1/2*h-1/2*k,-l 0.036 for -h,-k,l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	5671	wwPDB-VP
Average B, all atoms (Å ²)	58.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.49% 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	0.34	0/1798	0.58	2/2429 (0.1%)
1	C	0.32	0/1806	0.54	0/2439
1	E	0.32	0/1794	0.55	2/2423 (0.1%)
2	B	0.24	0/99	0.55	0/133
2	D	0.24	0/99	0.51	0/133
2	F	0.26	0/98	0.55	0/132
All	All	0.32	0/5694	0.55	4/7689 (0.1%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	87	ILE	CG1-CB-CG2	-6.36	97.42	111.40
1	E	16	LEU	CA-CB-CG	-6.19	101.06	115.30
1	E	235	LEU	CA-CB-CG	5.89	128.85	115.30
1	A	16	LEU	CA-CB-CG	-5.54	102.56	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	1776	0	1752	33	0
1	C	1784	0	1763	35	0
1	E	1772	0	1751	31	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	98	0	92	0	0
2	D	98	0	92	1	0
2	F	97	0	90	0	0
3	A	6	0	0	1	0
3	B	2	0	0	0	0
3	C	14	0	0	0	1
3	D	3	0	0	1	0
3	E	19	0	0	4	0
3	F	2	0	0	0	0
All	All	5671	0	5540	97	1

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.

All (97) 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:E:16:LEU:HD13	1:E:79:LEU:CD1	2.04	0.87
1:A:7:VAL:HA	1:A:87:ILE:HG23	1.55	0.86
1:E:229:MET:HG3	1:E:235:LEU:HD23	1.60	0.84
1:E:38:GLN:NE2	1:E:126:LEU:O	2.15	0.80
1:C:38:GLN:NE2	1:C:126:LEU:O	2.14	0.79
1:A:38:GLN:NE2	1:A:126:LEU:O	2.16	0.79
1:A:119:MET:O	3:A:301:HOH:O	2.02	0.77
1:E:16:LEU:HD13	1:E:79:LEU:HD13	1.71	0.73
1:C:16:LEU:HD22	1:C:79:LEU:HD12	1.72	0.71
1:C:130:GLU:HA	1:C:130:GLU:OE2	1.90	0.70
1:E:42:SER:O	3:E:301:HOH:O	2.12	0.68
1:E:12:LEU:O	1:E:16:LEU:HD12	1.96	0.64
1:C:138:LYS:HG2	1:C:226:THR:HG22	1.81	0.63
2:D:162:THR:N	3:D:201:HOH:O	2.30	0.63
1:E:207:PHE:CZ	1:E:235:LEU:HB2	2.34	0.63
1:E:193:GLU:N	3:E:304:HOH:O	2.35	0.59
1:C:228:SER:HB2	1:C:236:VAL:HB	1.86	0.57
1:C:52:LEU:HB3	1:C:244:MET:HE1	1.86	0.57
1:A:23:ILE:HB	1:A:72:LEU:HD12	1.88	0.56
1:C:15:VAL:HG12	1:C:16:LEU:HD12	1.88	0.56
1:E:7:VAL:HA	1:E:87:ILE:HD12	1.86	0.55
1:C:45:VAL:HG21	1:C:211:TYR:CE2	2.42	0.55
1:A:210:ARG:NH2	1:A:211:TYR:OH	2.40	0.54
1:C:23:ILE:HB	1:C:72:LEU:HD12	1.89	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:23:ILE:HB	1:E:72:LEU:HD12	1.90	0.54
1:E:27:CYS:SG	1:E:67:ALA:HB1	2.49	0.53
1:A:78:ILE:HD13	1:A:116:MET:HB2	1.91	0.53
1:E:159:VAL:CG2	1:E:170:SER:HB2	2.38	0.53
1:E:130:GLU:HA	1:E:130:GLU:OE2	2.08	0.52
1:E:45:VAL:HG21	1:E:211:TYR:CE2	2.45	0.52
1:A:29:ASP:HB2	1:A:36:ASN:HB3	1.92	0.52
1:E:91:ARG:HB3	1:E:100:ALA:HB3	1.91	0.51
1:A:45:VAL:HG21	1:A:211:TYR:CE2	2.46	0.51
1:C:175:LEU:HD23	1:C:175:LEU:H	1.77	0.50
1:C:5:ARG:NH1	1:C:5:ARG:HB3	2.25	0.50
1:A:103:PHE:HB2	1:A:112:SER:HB2	1.92	0.50
1:C:193:GLU:HG3	1:C:194:ALA:H	1.78	0.48
1:E:147:ILE:HG12	1:E:180:ILE:HG21	1.95	0.48
1:C:30:ILE:HG13	1:C:35:VAL:HG22	1.94	0.48
1:A:91:ARG:HB3	1:A:100:ALA:HB3	1.96	0.48
1:C:78:ILE:HD13	1:C:116:MET:HB2	1.95	0.48
1:A:22:LEU:HG	1:A:41:ASP:HB2	1.95	0.48
1:C:27:CYS:SG	1:C:67:ALA:HB1	2.53	0.47
1:C:133:TYR:HA	1:C:230:SER:OG	2.15	0.47
1:E:235:LEU:CD1	1:E:237:VAL:HG23	2.45	0.47
1:E:78:ILE:HD13	1:E:116:MET:HB2	1.97	0.47
1:C:226:THR:OG1	1:C:238:GLU:HB3	2.14	0.46
1:E:29:ASP:HB2	1:E:36:ASN:HB3	1.97	0.46
1:C:53:ARG:HB3	1:C:55:GLU:OE2	2.16	0.46
1:A:68:MET:SD	1:A:99:LEU:HD13	2.56	0.46
1:C:112:SER:HB3	1:C:114:TYR:CE1	2.51	0.46
1:A:23:ILE:HG21	1:A:26:ALA:HB2	1.98	0.45
1:C:135:CYS:SG	1:C:199:MET:HG3	2.56	0.45
1:C:48:VAL:HG22	1:C:249:TYR:CD2	2.51	0.45
1:C:28:TRP:CE2	1:C:37:LEU:HD12	2.52	0.45
1:C:37:LEU:HB3	1:C:50:LEU:HB3	1.98	0.45
1:A:7:VAL:HG13	1:A:58:ASP:CG	2.37	0.45
1:E:18:ALA:C	3:E:305:HOH:O	2.54	0.45
1:A:154:ILE:HA	1:A:175:LEU:HD21	1.98	0.45
1:A:28:TRP:CE2	1:A:37:LEU:HD12	2.52	0.45
1:E:166:GLY:N	3:E:306:HOH:O	2.49	0.45
1:A:22:LEU:HD12	1:A:214:PHE:HD2	1.80	0.44
1:C:50:LEU:HB2	1:C:247:LEU:HD13	1.99	0.44
1:A:112:SER:HB3	1:A:114:TYR:CE1	2.51	0.44
1:C:215:PHE:HE2	1:C:251:LEU:HB2	1.83	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:182:LEU:HA	1:C:109:GLU:O	2.18	0.44
1:A:4:ALA:HB1	1:A:57:PHE:CD2	2.52	0.44
1:A:175:LEU:HB2	1:C:74:SER:HB3	1.99	0.44
1:C:207:PHE:CZ	1:C:235:LEU:HB2	2.52	0.44
1:C:235:LEU:O	1:C:250:TYR:HA	2.18	0.44
1:E:226:THR:OG1	1:E:238:GLU:HB3	2.18	0.44
1:C:29:ASP:HB2	1:C:36:ASN:HB3	1.99	0.44
1:A:22:LEU:HG	1:A:41:ASP:CB	2.48	0.44
1:E:159:VAL:HG23	1:E:170:SER:HB2	2.00	0.44
1:E:4:ALA:HB1	1:E:57:PHE:CD2	2.53	0.44
1:A:16:LEU:HD13	1:A:79:LEU:HD13	1.99	0.43
1:A:37:LEU:HB3	1:A:50:LEU:HB3	2.00	0.43
1:E:175:LEU:HD23	1:E:175:LEU:H	1.84	0.43
1:A:146:ARG:HE	1:A:150:ASP:CG	2.22	0.43
1:A:134:SER:H	1:A:230:SER:HB2	1.84	0.43
1:A:227:LEU:HD22	1:A:237:VAL:HG22	1.99	0.43
1:E:52:LEU:HB3	1:E:244:MET:HE1	2.01	0.42
1:E:55:GLU:H	1:E:55:GLU:CD	2.22	0.42
1:C:227:LEU:HD22	1:C:237:VAL:HG22	2.00	0.42
1:A:134:SER:HB3	1:A:201:GLU:HB3	2.02	0.42
1:A:235:LEU:O	1:A:250:TYR:HA	2.19	0.42
1:A:215:PHE:HE2	1:A:251:LEU:HB2	1.85	0.42
1:C:222:SER:HB2	1:C:240:LYS:O	2.19	0.41
1:E:227:LEU:HD22	1:E:237:VAL:HG22	2.02	0.41
1:A:207:PHE:CZ	1:A:235:LEU:HB2	2.56	0.41
1:E:28:TRP:CE2	1:E:37:LEU:HD12	2.56	0.41
1:A:150:ASP:HB3	1:C:81:CYS:HB3	2.02	0.41
1:C:133:TYR:CG	1:C:228:SER:HB3	2.55	0.41
1:E:235:LEU:O	1:E:250:TYR:HA	2.20	0.41
1:E:48:VAL:HG22	1:E:249:TYR:CD1	2.55	0.41
1:A:27:CYS:SG	1:A:67:ALA:HB1	2.61	0.41
1:C:30:ILE:HG22	1:C:62:CYS:SG	2.61	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:312:HOH:O	3:C:312:HOH:O[2_557]	2.16	0.04

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	231/264 (88%)	227 (98%)	4 (2%)	0	100	100
1	C	231/264 (88%)	227 (98%)	4 (2%)	0	100	100
1	E	231/264 (88%)	226 (98%)	5 (2%)	0	100	100
2	B	11/20 (55%)	11 (100%)	0	0	100	100
2	D	11/20 (55%)	10 (91%)	1 (9%)	0	100	100
2	F	11/20 (55%)	11 (100%)	0	0	100	100
All	All	726/852 (85%)	712 (98%)	14 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	182/229 (80%)	178 (98%)	4 (2%)	55	72
1	C	185/229 (81%)	184 (100%)	1 (0%)	90	96
1	E	183/229 (80%)	176 (96%)	7 (4%)	36	50
2	B	10/17 (59%)	10 (100%)	0	100	100
2	D	10/17 (59%)	10 (100%)	0	100	100
2	F	10/17 (59%)	9 (90%)	1 (10%)	8	10
All	All	580/738 (79%)	567 (98%)	13 (2%)	55	72

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2	PHE
1	A	32	SER
1	A	175	LEU
1	A	210	ARG
1	C	2	PHE
1	E	2	PHE
1	E	16	LEU
1	E	162	CYS
1	E	175	LEU
1	E	200	ASN
1	E	222	SER
1	E	230	SER
2	F	163	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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

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	241/264 (91%)	0.09	7 (2%) 51 59	45, 57, 73, 89	0
1	C	241/264 (91%)	0.06	3 (1%) 79 83	42, 57, 73, 89	0
1	E	241/264 (91%)	0.07	4 (1%) 70 76	44, 57, 74, 85	0
2	B	13/20 (65%)	-0.10	0 100 100	45, 51, 71, 71	0
2	D	13/20 (65%)	0.20	1 (7%) 13 18	43, 51, 71, 74	0
2	F	13/20 (65%)	-0.13	0 100 100	45, 51, 69, 71	0
All	All	762/852 (89%)	0.07	15 (1%) 65 71	42, 57, 74, 89	0

All (15) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	182	LEU	4.2
1	A	106	PRO	3.7
1	A	87	ILE	3.7
1	E	66	LEU	3.3
1	E	95	ASN	3.2
2	D	174	GLY	2.9
1	A	183	SER	2.7
1	A	105	ALA	2.3
1	E	105	ALA	2.2
1	C	182	LEU	2.1
1	A	167	VAL	2.1
1	C	183	SER	2.1
1	A	203	VAL	2.1
1	E	106	PRO	2.1
1	C	167	VAL	2.0

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 carbohydrates 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.