Full wwPDB X-ray Structure Validation Report (i)

Nov 1, 2023 – 11:33 PM EDT

PDB ID	:	3I34
Title	:	Proteinase K by LB Nanotemplate Method after high X-Ray dose on ID14-2 Beamline at ESRF
Authors	:	Pechkova, E.; Tripathi, S.K.; Ravelli, R.; McSweeney, S.; Nicolini, C.
Deposited on	:	2009-06-30
Resolution	:	1.00 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 (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 (1)) were used in the production of this report:

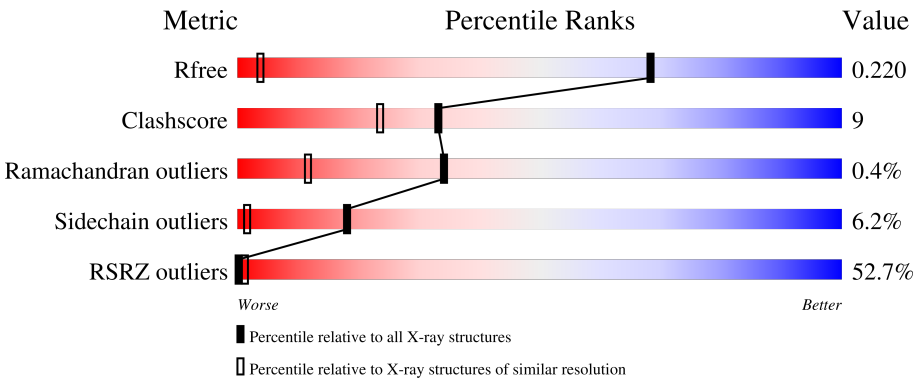
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.36
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

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 1.00 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	1050 (1.06-0.94)
Clashscore	141614	1117 (1.06-0.94)
Ramachandran outliers	138981	1043 (1.06-0.94)
Sidechain outliers	138945	1045 (1.06-0.94)
RSRZ outliers	127900	1023 (1.06-0.94)

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	X	279	53% 84% 13% •

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	HG	X	280	-	-	-	X

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 2410 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 Proteinase K.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	X	279	2021	1242	353	416	10	0	1	0

- Molecule 2 is MERCURY (II) ION (three-letter code: HG) (formula: Hg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Hg		
2	X	2	3	3	0	1

- Molecule 3 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Ca		
3	X	1	1	1	0	0

- Molecule 4 is water.

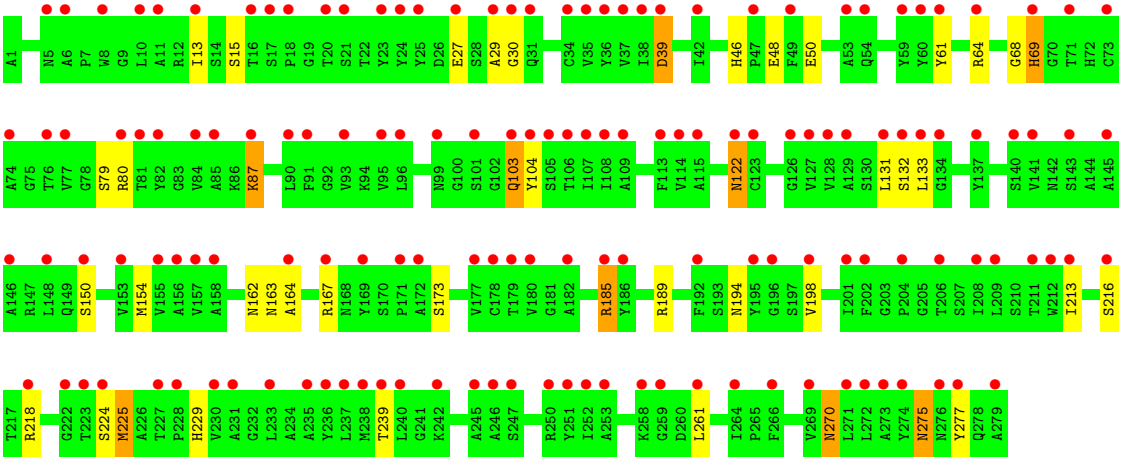
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
4	X	385	385	385	0	0

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: Proteinase K

Chain X:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α, β, γ	67.86Å 67.86Å 102.33Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	23.99 – 1.00 23.36 – 1.00	Depositor EDS
% Data completeness (in resolution range)	82.6 (23.99-1.00) 82.6 (23.36-1.00)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	0.11	Depositor
$< I/\sigma(I) >$ [1]	0.89 (at 1.00Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.206 , 0.220 0.205 , 0.220	Depositor DCC
R_{free} test set	5279 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å^2)	5.9	Xtriage
Anisotropy	0.014	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.38 , 44.9	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	2410	wwPDB-VP
Average B, all atoms (Å^2)	8.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.37% 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 (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: CA, HG

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	X	0.30	0/2065	0.53	0/2805

There are no bond length outliers.

There are no bond angle outliers.

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	X	2021	0	1919	34	2
2	X	3	0	0	0	0
3	X	1	0	0	0	0
4	X	385	0	0	4	3
All	All	2410	0	1919	34	4

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 (34) 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:X:29:ALA:HB3	1:X:87:LYS:HD3	1.27	1.15
1:X:29:ALA:CB	1:X:87:LYS:HD3	2.05	0.86
1:X:261:LEU:H	1:X:270:ASN:HD21	1.30	0.78
1:X:46:HIS:HD2	1:X:48:GLU:H	1.30	0.77
1:X:69:HIS:HE1	1:X:224[A]:SER:OG	1.70	0.74
1:X:30:GLY:C	1:X:239:THR:HG21	2.11	0.70
1:X:173:SER:HA	1:X:198:VAL:HG21	1.80	0.64
1:X:69:HIS:CE1	1:X:224[A]:SER:OG	2.50	0.63
1:X:103:GLN:NE2	1:X:103:GLN:H	1.97	0.62
1:X:167:ARG:HD3	4:X:400:HOH:O	2.00	0.61
1:X:163:ASN:ND2	1:X:189:ARG:HH12	2.02	0.58
1:X:50:GLU:OE2	1:X:80:ARG:HD3	2.05	0.57
1:X:30:GLY:HA2	1:X:239:THR:HG21	1.88	0.56
1:X:30:GLY:CA	1:X:239:THR:HG21	2.36	0.55
1:X:132:SER:HB3	1:X:224[A]:SER:OG	2.08	0.54
1:X:46:HIS:HE1	1:X:216:SER:O	1.92	0.52
1:X:164:ALA:H	1:X:194:ASN:ND2	2.09	0.51
1:X:185:ARG:O	1:X:185:ARG:HG2	2.11	0.50
1:X:13:ILE:HD11	1:X:229:HIS:HB3	1.94	0.50
1:X:275:ASN:ND2	1:X:277:TYR:H	2.10	0.50
1:X:225:MET:O	1:X:229:HIS:HD2	1.95	0.49
1:X:87:LYS:HE3	4:X:659:HOH:O	2.13	0.49
1:X:64:ARG:CG	4:X:467:HOH:O	2.60	0.48
1:X:103:GLN:H	1:X:103:GLN:CD	2.14	0.48
1:X:164:ALA:H	1:X:194:ASN:HD22	1.63	0.47
1:X:162:ASN:HB2	1:X:194:ASN:HD21	1.81	0.45
1:X:131:LEU:HD22	1:X:133:LEU:HD11	1.98	0.45
1:X:46:HIS:CD2	1:X:48:GLU:H	2.20	0.44
1:X:163:ASN:HD22	1:X:189:ARG:HH12	1.64	0.44
1:X:39:ASP:OD1	1:X:69:HIS:CD2	2.72	0.43
1:X:48:GLU:HB3	1:X:79:SER:HB2	2.01	0.42
1:X:133:LEU:HB2	4:X:651:HOH:O	2.19	0.41
1:X:30:GLY:HA2	1:X:239:THR:CG2	2.50	0.41
1:X:68:GLY:HA2	1:X:213:ILE:HG23	2.02	0.40

All (4) 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)
1:X:150:SER:CB	4:X:375:HOH:O[7_465]	1.51	0.69
1:X:15:SER:OG	1:X:122:ASN:ND2[5_444]	1.53	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:X:605:HOH:O	4:X:605:HOH:O[7_465]	1.70	0.50
4:X:497:HOH:O	4:X:663:HOH:O[3_454]	2.18	0.02

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	X	278/279 (100%)	271 (98%)	6 (2%)	1 (0%)	34 12

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	X	39	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	X	212/213 (100%)	199 (94%)	13 (6%)	18 1

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

Mol	Chain	Res	Type
1	X	27	GLU
1	X	61	TYR
1	X	69	HIS

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Mol	Chain	Res	Type
1	X	87	LYS
1	X	103	GLN
1	X	104	TYR
1	X	122	ASN
1	X	154	MET
1	X	185	ARG
1	X	218	ARG
1	X	225	MET
1	X	270	ASN
1	X	275	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	X	46	HIS
1	X	54	GLN
1	X	89	GLN
1	X	99	ASN
1	X	162	ASN
1	X	163	ASN
1	X	194	ASN
1	X	229	HIS
1	X	270	ASN
1	X	275	ASN

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)

Of 4 ligands modelled in this entry, 4 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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	X	279/279 (100%)	2.27	147 (52%) 0 1	3, 5, 10, 15	0

All (147) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	X	61	TYR	13.9
1	X	279	ALA	8.2
1	X	80	ARG	7.7
1	X	132	SER	6.3
1	X	103	GLN	6.1
1	X	104	TYR	5.7
1	X	13	ILE	5.4
1	X	224[A]	SER	5.3
1	X	54	GLN	5.2
1	X	218	ARG	5.2
1	X	198	VAL	5.2
1	X	69	HIS	4.9
1	X	133	LEU	4.9
1	X	167	ARG	4.8
1	X	239	THR	4.6
1	X	27	GLU	4.6
1	X	87	LYS	4.3
1	X	122	ASN	4.1
1	X	99	ASN	4.0
1	X	31	GLN	4.0
1	X	185	ARG	4.0
1	X	134	GLY	3.9
1	X	131	LEU	3.8
1	X	250	ARG	3.6
1	X	186	TYR	3.6
1	X	201	ILE	3.2
1	X	127	VAL	3.2

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Mol	Chain	Res	Type	RSRZ
1	X	155	VAL	3.2
1	X	64	ARG	3.2
1	X	93	VAL	3.2
1	X	35	VAL	3.1
1	X	195	TYR	3.1
1	X	84	VAL	3.1
1	X	77	VAL	3.0
1	X	95	VAL	3.0
1	X	10	LEU	3.0
1	X	90	LEU	3.0
1	X	17	SER	3.0
1	X	261	LEU	2.9
1	X	106	THR	2.9
1	X	252	ILE	2.9
1	X	82	TYR	2.9
1	X	73	CYS	2.9
1	X	272	LEU	2.9
1	X	42	ILE	2.9
1	X	24	TYR	2.9
1	X	34	CYS	2.9
1	X	143	SER	2.9
1	X	230	VAL	2.8
1	X	123	CYS	2.8
1	X	38	ILE	2.8
1	X	8	TRP	2.8
1	X	36	TYR	2.8
1	X	148	LEU	2.8
1	X	91	PHE	2.8
1	X	113	PHE	2.8
1	X	213	ILE	2.8
1	X	96	LEU	2.7
1	X	37	VAL	2.7
1	X	212	TRP	2.7
1	X	23	TYR	2.7
1	X	107	ILE	2.7
1	X	227	THR	2.7
1	X	101	SER	2.7
1	X	240	LEU	2.7
1	X	59	TYR	2.7
1	X	202	PHE	2.7
1	X	180	VAL	2.6
1	X	150	SER	2.6

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Mol	Chain	Res	Type	RSRZ
1	X	115	ALA	2.6
1	X	114	VAL	2.6
1	X	182	ALA	2.6
1	X	231	ALA	2.6
1	X	246	ALA	2.6
1	X	271	LEU	2.6
1	X	238	MET	2.6
1	X	49	PHE	2.6
1	X	157	VAL	2.5
1	X	269	VAL	2.5
1	X	29	ALA	2.5
1	X	178	CYS	2.5
1	X	21	SER	2.5
1	X	233	LEU	2.5
1	X	47	PRO	2.5
1	X	6	ALA	2.4
1	X	16	THR	2.4
1	X	274	TYR	2.4
1	X	11	ALA	2.4
1	X	164	ALA	2.4
1	X	242	LYS	2.4
1	X	153	VAL	2.4
1	X	177	VAL	2.4
1	X	5	ASN	2.4
1	X	108	ILE	2.4
1	X	196	GLY	2.3
1	X	171	PRO	2.3
1	X	156	ALA	2.3
1	X	253	ALA	2.3
1	X	237	LEU	2.3
1	X	25	TYR	2.3
1	X	169	TYR	2.3
1	X	236	TYR	2.3
1	X	235	ALA	2.3
1	X	209	LEU	2.3
1	X	216	SER	2.3
1	X	137	TYR	2.3
1	X	211	THR	2.3
1	X	259	GLY	2.3
1	X	192	PHE	2.3
1	X	276	ASN	2.3
1	X	245	ALA	2.3

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Mol	Chain	Res	Type	RSRZ
1	X	140	SER	2.3
1	X	81	THR	2.3
1	X	251	TYR	2.3
1	X	18	PRO	2.3
1	X	129	ALA	2.2
1	X	128	VAL	2.2
1	X	223	THR	2.2
1	X	204	PRO	2.2
1	X	179	THR	2.2
1	X	39	ASP	2.2
1	X	60	TYR	2.2
1	X	158	ALA	2.2
1	X	172	ALA	2.2
1	X	258	LYS	2.2
1	X	206	THR	2.2
1	X	85	ALA	2.2
1	X	76	THR	2.2
1	X	208	ILE	2.2
1	X	141	VAL	2.1
1	X	146	ALA	2.1
1	X	266	PHE	2.1
1	X	222	GLY	2.1
1	X	105	SER	2.1
1	X	277	TYR	2.1
1	X	228	PRO	2.1
1	X	264	ILE	2.1
1	X	71	THR	2.1
1	X	247	SER	2.0
1	X	126	GLY	2.0
1	X	273	ALA	2.0
1	X	30	GLY	2.0
1	X	20	THR	2.0
1	X	53	ALA	2.0
1	X	74	ALA	2.0
1	X	109	ALA	2.0
1	X	145	ALA	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 monosaccharides in this entry.

6.4 Ligands (i)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	HG	X	280	1/1	0.14	1.74	200,200,200,200	0
3	CA	X	281	1/1	0.87	0.28	46,46,46,46	0
2	HG	X	282[B]	1/1	0.97	0.38	16,16,16,16	1
2	HG	X	282[A]	1/1	0.97	0.38	200,200,200,200	1

6.5 Other polymers (i)

There are no such residues in this entry.