



# Full wwPDB X-ray Structure Validation Report ⓘ

Jan 31, 2016 – 11:52 PM GMT

PDB ID : 1YXV  
Title : Crystal Structure of Kinase Pim1 in complex with 3,4-Dihydroxy-1-methylqu  
inolin-2(1H)-one  
Authors : Kumar, A.; Mandiyan, V.; Suzuki, Y.; Zhang, C.; Rice, J.; Tsai, J.; Artis,  
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Deposited on : 2005-02-22  
Resolution : 2.00 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](mailto:validation@mail.wwpdb.org)  
A user guide is available at  
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>  
with specific help available everywhere you see the ⓘ symbol.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.7 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20026688  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Refmac : 5.8.0135  
CCP4 : 6.5.0  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

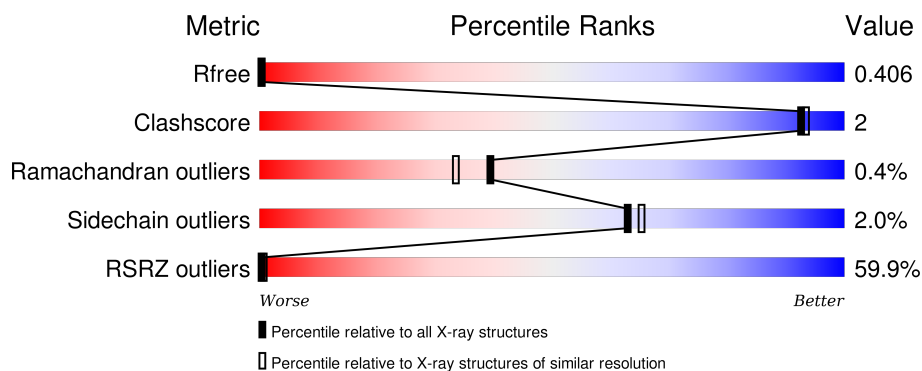
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.00 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))
$R_{free}$	91344	6249 (2.00-2.00)
Clashscore	102246	7340 (2.00-2.00)
Ramachandran outliers	100387	7248 (2.00-2.00)
Sidechain outliers	100360	7247 (2.00-2.00)
RSRZ outliers	91569	6262 (2.00-2.00)

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  $\geq 3$ , 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	293	

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 2436 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.

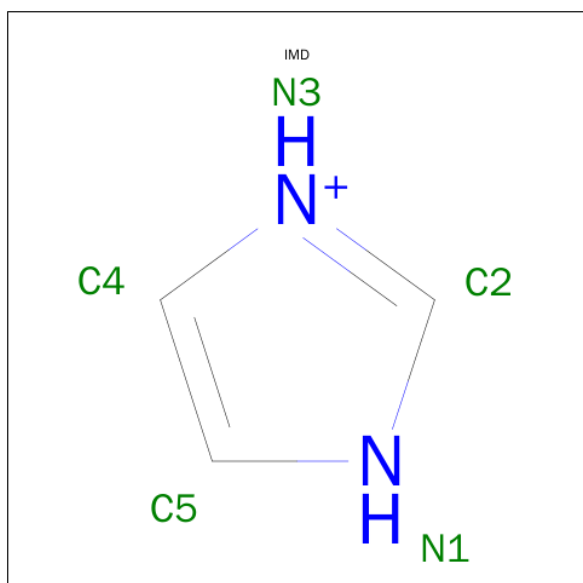
- Molecule 1 is a protein called Proto-oncogene serine/threonine-protein kinase Pim-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	274	Total	C	N	O	S	0	2	0
			2247	1435	393	411	8			

There are 8 discrepancies between the modelled and reference sequences:

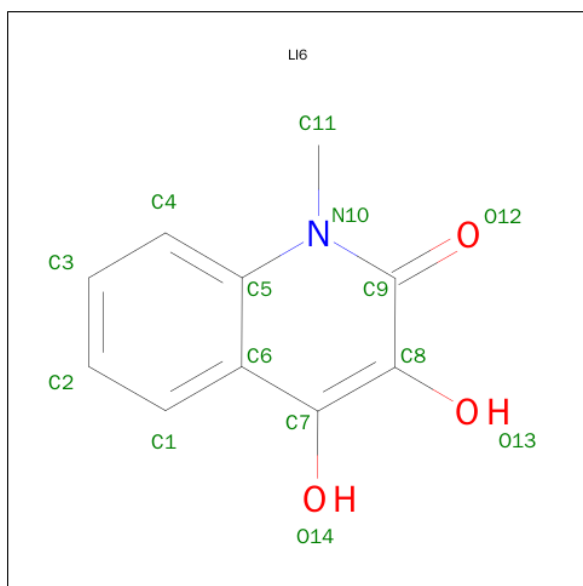
Chain	Residue	Modelled	Actual	Comment	Reference
A	314	VAL	-	EXPRESSION TAG	UNP P11309
A	315	ASP	-	EXPRESSION TAG	UNP P11309
A	316	HIS	-	EXPRESSION TAG	UNP P11309
A	317	HIS	-	EXPRESSION TAG	UNP P11309
A	318	HIS	-	EXPRESSION TAG	UNP P11309
A	319	HIS	-	EXPRESSION TAG	UNP P11309
A	320	HIS	-	EXPRESSION TAG	UNP P11309
A	321	HIS	-	EXPRESSION TAG	UNP P11309

- Molecule 2 is IMIDAZOLE (three-letter code: IMD) (formula: C<sub>3</sub>H<sub>5</sub>N<sub>2</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	N		
			5	3	2	0	0

- Molecule 3 is 3,4-DIHYDROXY-1-METHYLQUINOLIN-2(1H)-ONE (three-letter code: LI6) (formula:  $C_{10}H_9NO_3$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O		
			14	10	1	3	0	0

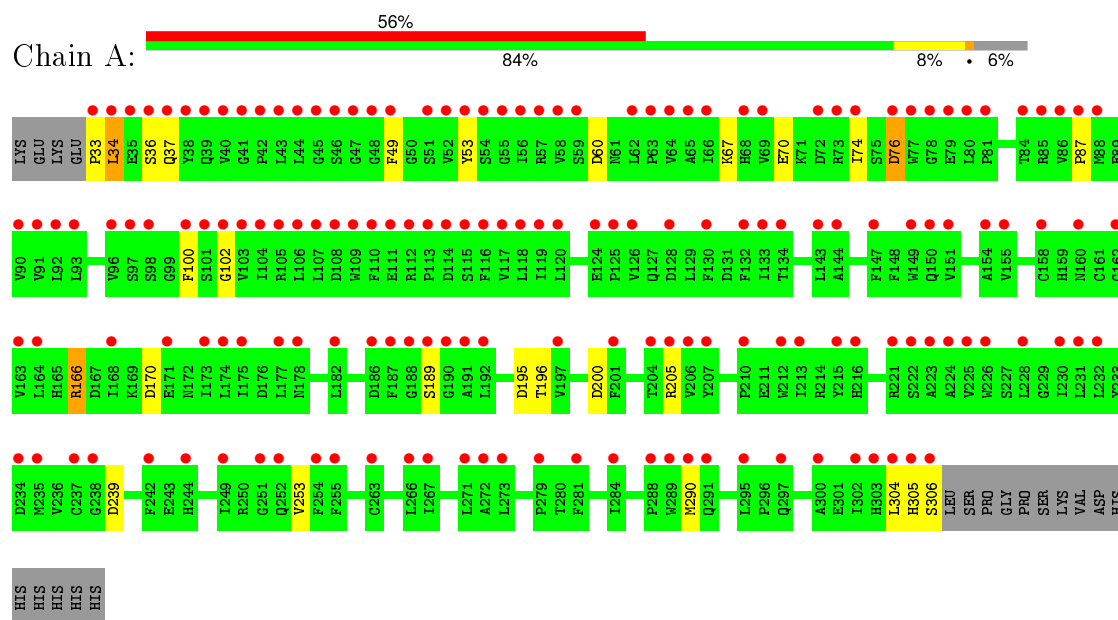
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	170	Total	O		
			170	170	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 errors 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 ( $\text{RSRZ} > 2$ ). 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: Proto-oncogene serine/threonine-protein kinase Pim-1



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 65	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	96.59 Å 96.59 Å 80.56 Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	84.51 – 2.00 48.30 – 1.98	Depositor EDS
% Data completeness (in resolution range)	99.5 (84.51-2.00) 98.6 (48.30-1.98)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	0.07	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.82 (at 1.98 Å)	Xtriage
Refinement program	REFMAC 5.1.25	Depositor
R, $R_{free}$	0.188 , 0.211 0.410 , 0.406	Depositor DCC
$R_{free}$ test set	1463 reflections (5.35%)	DCC
Wilson B-factor (Å <sup>2</sup> )	33.5	Xtriage
Anisotropy	0.187	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 28.5	EDS
Estimated twinning fraction	0.049 for h,-h-k,-l	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtriage
Outliers	0 of 29461 reflections	Xtriage
$F_o, F_c$ correlation	0.79	EDS
Total number of atoms	2436	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	25.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.77% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.375 respectively for untwinned datasets, and 0.333, 0.2 for perfectly twinned datasets.

## 5 Model quality ⓘ

### 5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: LI6, IMD

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	0.44	0/2307	0.79	8/3131 (0.3%)

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	195	ASP	CB-CG-OD2	5.98	123.68	118.30
1	A	76	ASP	CB-CG-OD2	5.82	123.54	118.30
1	A	166	ARG	NE-CZ-NH2	-5.79	117.41	120.30
1	A	60	ASP	CB-CG-OD2	5.69	123.42	118.30
1	A	200	ASP	CB-CG-OD2	5.66	123.40	118.30
1	A	239	ASP	CB-CG-OD2	5.56	123.30	118.30
1	A	170	ASP	CB-CG-OD1	5.17	122.95	118.30
1	A	166	ARG	NE-CZ-NH1	5.12	122.86	120.30

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	2247	0	2185	9	2
2	A	5	0	5	0	0
3	A	14	0	7	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	A	170	0	0	2	1
All	All	2436	0	2197	9	2

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 2.

All (9) 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:33:PRO:HA	1:A:37:GLN:HE21	1.38	0.89
1:A:166:ARG:HD3	1:A:189:SER:O	2.04	0.57
1:A:33:PRO:O	1:A:34:LEU:CB	2.60	0.49
1:A:100:PHE:CZ	1:A:102:GLY:HA3	2.48	0.49
1:A:253:VAL:HG23	4:A:489:HOH:O	2.15	0.46
1:A:74:ILE:HD13	1:A:87:PRO:HG3	1.97	0.45
1:A:49:PHE:O	1:A:67:LYS:HE2	2.17	0.44
1:A:305:HIS:CG	1:A:305:HIS:O	2.71	0.44
1:A:205:ARG:NH2	4:A:416:HOH:O	2.55	0.40

All (2) 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:A:70:GLU:OE2	1:A:196:THR:OG1[5_665]	1.94	0.26
1:A:53:TYR:OH	4:A:457:HOH:O[5_665]	1.96	0.24

## 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	274/293 (94%)	265 (97%)	8 (3%)	1 (0%)	39 33

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	34	LEU

### 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	247/263 (94%)	242 (98%)	5 (2%)	63	65

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	36	SER
1	A	76	ASP
1	A	290	MET
1	A	304	LEU
1	A	306	SER

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	37	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

## 5.5 Carbohydrates

There are no carbohydrates in this entry.

## 5.6 Ligand geometry

2 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. 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  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z  > 2$	Counts	RMSZ	$\# Z  > 2$
2	IMD	A	322	-	3,5,5	0.51	0	4,5,5	0.62	0
3	LI6	A	323	-	15,15,15	2.72	5 (33%)	14,22,22	0.93	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the chemical component dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	IMD	A	322	-	-	0/0/0/0	0/1/1/1
3	LI6	A	323	-	-	0/0/0/0	0/2/2/2

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	323	LI6	C7-C6	2.14	1.48	1.43
3	A	323	LI6	C9-N10	2.91	1.42	1.38
3	A	323	LI6	C9-C8	3.36	1.49	1.40
3	A	323	LI6	C6-C5	3.74	1.49	1.42
3	A	323	LI6	C8-C7	7.98	1.48	1.36

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 ⓘ

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	274/293 (93%)	2.58	164 (59%) 0 1	14, 22, 40, 50	0

All (164) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	58	VAL	10.0
1	A	40	VAL	7.8
1	A	116	PHE	5.9
1	A	64	VAL	5.9
1	A	126	VAL	5.6
1	A	86	VAL	5.6
1	A	38	TYR	5.5
1	A	80	LEU	5.3
1	A	178	ASN	5.3
1	A	90	VAL	5.2
1	A	113	PRO	5.2
1	A	41	GLY	5.0
1	A	110	PHE	4.9
1	A	42	PRO	4.9
1	A	151	VAL	4.9
1	A	306	SER	4.9
1	A	231	LEU	4.7
1	A	56	ILE	4.7
1	A	44	LEU	4.7
1	A	117	VAL	4.6
1	A	52	VAL	4.6
1	A	72	ASP	4.6
1	A	48	GLY	4.5
1	A	175	ILE	4.5
1	A	164	LEU	4.4
1	A	93	LEU	4.4
1	A	39	GLN	4.3

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Mol	Chain	Res	Type	RSRZ
1	A	100	PHE	4.3
1	A	69	VAL	4.3
1	A	163	VAL	4.3
1	A	254	PHE	4.2
1	A	204	THR	4.2
1	A	59	SER	4.2
1	A	84	THR	4.1
1	A	47	GLY	4.1
1	A	212	TRP	4.1
1	A	155	VAL	4.1
1	A	33	PRO	4.1
1	A	188	GLY	4.0
1	A	62	LEU	4.0
1	A	300	ALA	4.0
1	A	197	VAL	4.0
1	A	223	ALA	4.0
1	A	189	SER	3.9
1	A	147	PHE	3.9
1	A	77	TRP	3.8
1	A	34	LEU	3.8
1	A	107	LEU	3.8
1	A	111	GLU	3.8
1	A	74	ILE	3.8
1	A	249	ILE	3.8
1	A	106	LEU	3.8
1	A	85	ARG	3.7
1	A	49	PHE	3.7
1	A	207	TYR	3.7
1	A	109	TRP	3.6
1	A	118	LEU	3.6
1	A	267	ILE	3.6
1	A	68	HIS	3.6
1	A	174	LEU	3.6
1	A	192	LEU	3.6
1	A	108	ASP	3.6
1	A	96	VAL	3.6
1	A	55	GLY	3.6
1	A	36	SER	3.6
1	A	177	LEU	3.5
1	A	37	GLN	3.5
1	A	190	GLY	3.5
1	A	53	TYR	3.5

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Mol	Chain	Res	Type	RSRZ
1	A	273	LEU	3.5
1	A	114	ASP	3.4
1	A	76	ASP	3.4
1	A	213	ILE	3.4
1	A	115	SER	3.4
1	A	46	SER	3.4
1	A	102	GLY	3.4
1	A	297	GLN	3.3
1	A	216	HIS	3.3
1	A	132	PHE	3.3
1	A	119	ILE	3.3
1	A	173	ILE	3.2
1	A	101	SER	3.2
1	A	158	CYS	3.2
1	A	54	SER	3.2
1	A	103	VAL	3.2
1	A	305	HIS	3.2
1	A	191	ALA	3.1
1	A	35	GLU	3.1
1	A	63	PRO	3.1
1	A	150	GLN	3.1
1	A	222	SER	3.1
1	A	252[A]	GLN	3.0
1	A	120	LEU	3.0
1	A	66	ILE	3.0
1	A	143	LEU	3.0
1	A	201	PHE	3.0
1	A	104	ILE	2.9
1	A	242	PHE	2.9
1	A	45	GLY	2.9
1	A	134	THR	2.9
1	A	304	LEU	2.9
1	A	51	SER	2.9
1	A	281	PHE	2.9
1	A	97	SER	2.9
1	A	271	LEU	2.9
1	A	186[A]	ASP	2.8
1	A	105	ARG	2.8
1	A	78	GLY	2.8
1	A	125	PRO	2.7
1	A	98	SER	2.7
1	A	130	PHE	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	79	GLU	2.7
1	A	81	PRO	2.7
1	A	279	PRO	2.7
1	A	43	LEU	2.6
1	A	73	ARG	2.6
1	A	92	LEU	2.6
1	A	295	LEU	2.6
1	A	91	VAL	2.6
1	A	266	LEU	2.6
1	A	128	ASP	2.6
1	A	57	ARG	2.5
1	A	112	ARG	2.5
1	A	226	TRP	2.5
1	A	168	ILE	2.5
1	A	87	PRO	2.5
1	A	232	LEU	2.4
1	A	187	PHE	2.4
1	A	251	GLY	2.4
1	A	88	MET	2.4
1	A	228	LEU	2.4
1	A	237	CYS	2.4
1	A	206	VAL	2.3
1	A	235	MET	2.3
1	A	154	ALA	2.3
1	A	272	ALA	2.3
1	A	244	HIS	2.3
1	A	65	ALA	2.3
1	A	263	CYS	2.3
1	A	284	ILE	2.3
1	A	144	ALA	2.3
1	A	238	GLY	2.2
1	A	215	TYR	2.2
1	A	255	PHE	2.2
1	A	221	ARG	2.2
1	A	302	ILE	2.2
1	A	124	GLU	2.2
1	A	149	TRP	2.2
1	A	289	TRP	2.2
1	A	288	PRO	2.2
1	A	225	VAL	2.1
1	A	160	ASN	2.1
1	A	182	LEU	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	205	ARG	2.1
1	A	230	ILE	2.1
1	A	224	ALA	2.1
1	A	290	MET	2.1
1	A	291	GLN	2.1
1	A	234	ASP	2.0
1	A	303	HIS	2.0
1	A	133	ILE	2.0
1	A	162	GLY	2.0
1	A	171	GLU	2.0
1	A	210	PRO	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](#)

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. The B-factors column lists the minimum, median, 95<sup>th</sup> 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	LLDF	B-factors(Å <sup>2</sup> )	Q<0.9
3	LI6	A	323	14/14	0.54	0.39	1.91	43,45,45,47	0
2	IMD	A	322	5/5	0.73	0.24	0.26	43,44,44,44	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.