



Full wwPDB X-ray Structure Validation Report ⓘ

May 16, 2020 – 11:08 pm BST

PDB ID : 3URB
Title : Crystal Structure of PTE mutant H254G/H257W/L303T/M317L/I106C/F13
2I/L271I/K185R/I274N/A80V/R67H
Authors : Tsai, P.; Fox, N.G.; Li, Y.; Barondeau, D.P.; Raushel, F.M.
Deposited on : 2011-11-21
Resolution : 1.77 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
Mogul : 1.8.5 (274361), CSD as541be (2020)
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

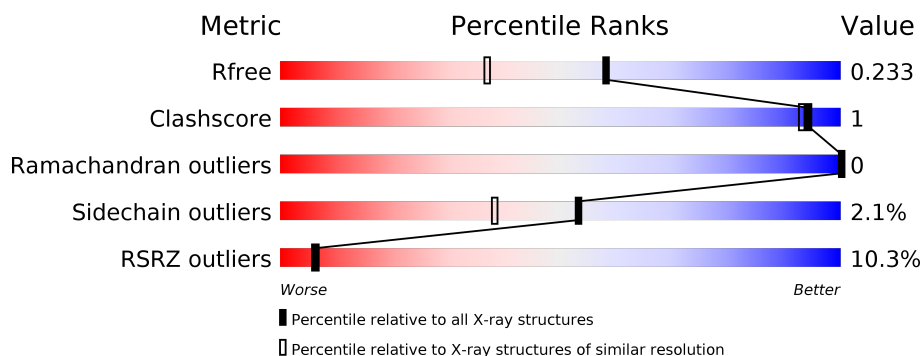
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.77 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	9185 (1.80-1.76)
Clashscore	141614	10184 (1.80-1.76)
Ramachandran outliers	138981	10051 (1.80-1.76)
Sidechain outliers	138945	10050 (1.80-1.76)
RSRZ outliers	127900	9032 (1.80-1.76)

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	327	<div> <div>5%</div> <div> <div></div> <div>94%</div> <div>..</div> </div> </div>
1	B	327	<div> <div>15%</div> <div> <div></div> <div>96%</div> <div>..</div> </div> </div>

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 5506 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.

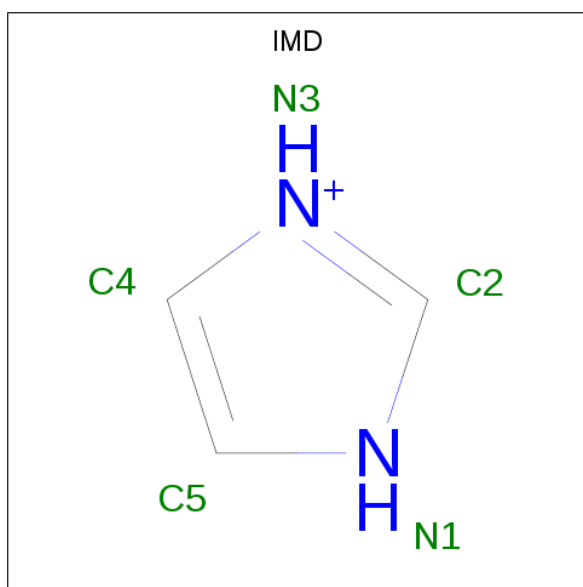
- Molecule 1 is a protein called Parathion hydrolase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	321	Total	C	N	O	S	0	0	0
			2452	1549	437	459	7			
1	B	323	Total	C	N	O	S	0	0	0
			2468	1559	439	463	7			

There are 22 discrepancies between the modelled and reference sequences:

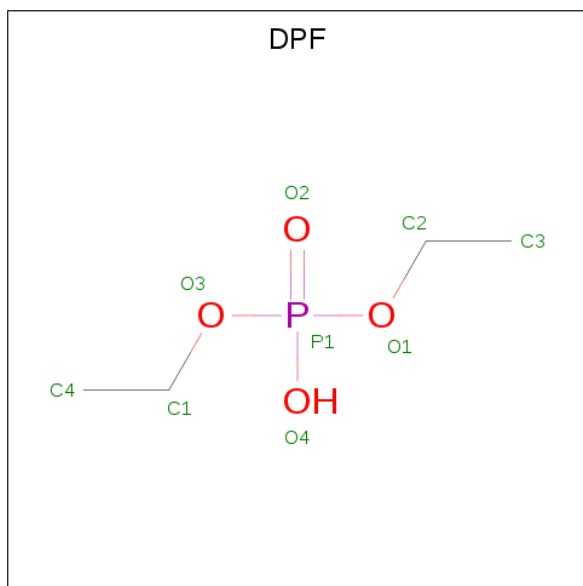
Chain	Residue	Modelled	Actual	Comment	Reference
A	67	HIS	ARG	ENGINEERED MUTATION	UNP P0A434
A	80	VAL	ALA	ENGINEERED MUTATION	UNP P0A434
A	106	CYS	ILE	ENGINEERED MUTATION	UNP P0A434
A	132	ILE	PHE	ENGINEERED MUTATION	UNP P0A434
A	185	ARG	LYS	ENGINEERED MUTATION	UNP P0A434
A	254	GLY	HIS	ENGINEERED MUTATION	UNP P0A434
A	257	TRP	HIS	ENGINEERED MUTATION	UNP P0A434
A	271	ILE	LEU	ENGINEERED MUTATION	UNP P0A434
A	274	ASN	ILE	ENGINEERED MUTATION	UNP P0A434
A	303	THR	LEU	ENGINEERED MUTATION	UNP P0A434
A	317	LEU	MET	ENGINEERED MUTATION	UNP P0A434
B	67	HIS	ARG	ENGINEERED MUTATION	UNP P0A434
B	80	VAL	ALA	ENGINEERED MUTATION	UNP P0A434
B	106	CYS	ILE	ENGINEERED MUTATION	UNP P0A434
B	132	ILE	PHE	ENGINEERED MUTATION	UNP P0A434
B	185	ARG	LYS	ENGINEERED MUTATION	UNP P0A434
B	254	GLY	HIS	ENGINEERED MUTATION	UNP P0A434
B	257	TRP	HIS	ENGINEERED MUTATION	UNP P0A434
B	271	ILE	LEU	ENGINEERED MUTATION	UNP P0A434
B	274	ASN	ILE	ENGINEERED MUTATION	UNP P0A434
B	303	THR	LEU	ENGINEERED MUTATION	UNP P0A434
B	317	LEU	MET	ENGINEERED MUTATION	UNP P0A434

- Molecule 2 is IMIDAZOLE (three-letter code: IMD) (formula: C₃H₅N₂).



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

- Molecule 3 is DIETHYL HYDROGEN PHOSPHATE (three-letter code: DPF) (formula: $C_4H_{11}O_4P$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	O	P	0	0
			9	4	4	1		
3	B	1	Total	C	O	P	0	0
			9	4	4	1		

- Molecule 4 is COBALT (II) ION (three-letter code: CO) (formula: Co).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	B	2	Total 2	Co 2	0	0
4	A	2	Total 2	Co 2	0	0

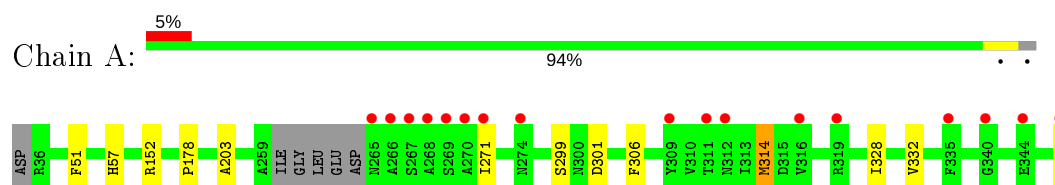
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	310	Total 310	O 310	0	0
5	B	249	Total 249	O 249	0	0

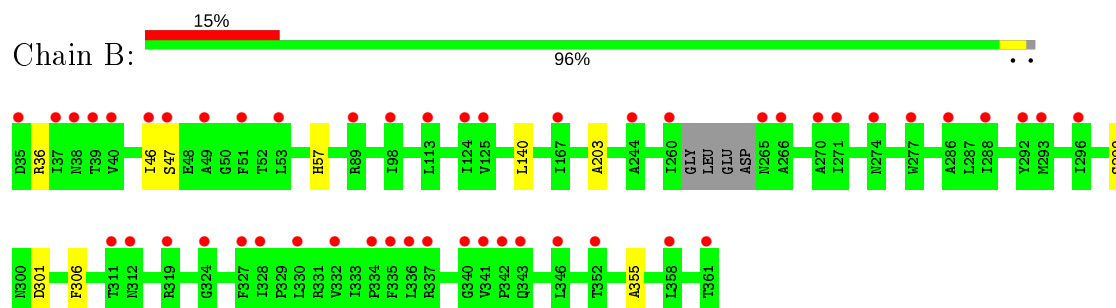
3 Residue-property plots [i](#)

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: Parathion hydrolase



• Molecule 1: Parathion hydrolase



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	85.47Å 86.40Å 88.12Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 1.77 39.25 – 1.77	Depositor EDS
% Data completeness (in resolution range)	99.8 (50.00-1.77) 99.8 (39.25-1.77)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	11.15 (at 1.77Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.216 , 0.234 0.215 , 0.233	Depositor DCC
R_{free} test set	3248 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å ²)	23.9	Xtriage
Anisotropy	0.473	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 36.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.015 for -h,l,k 0.016 for -l,-k,-h 0.015 for k,h,-l 0.001 for k,l,h 0.001 for l,h,k	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	5506	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.36% 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](#)

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

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	0.61	0/2486	0.73	1/3377 (0.0%)
1	B	0.60	0/2502	0.74	1/3399 (0.0%)
All	All	0.60	0/4988	0.74	2/6776 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	203	ALA	N-CA-C	-6.35	93.86	111.00
1	B	203	ALA	N-CA-C	-6.33	93.92	111.00

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	2452	0	2462	5	0
1	B	2468	0	2477	4	0
2	A	5	0	5	2	0
3	A	9	0	10	4	0
3	B	9	0	10	3	0
4	A	2	0	0	0	0
4	B	2	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	310	0	0	3	0
5	B	249	0	0	2	0
All	All	5506	0	4964	13	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 1.

All (13) 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)
3:B:902:DPF:H41	5:B:1547:HOH:O	1.90	0.72
1:B:301:ASP:OD2	3:B:902:DPF:H33	1.96	0.64
1:A:301:ASP:OD2	3:A:903:DPF:H22	2.00	0.60
2:A:901:IMD:H4	5:A:1267:HOH:O	2.05	0.57
2:A:901:IMD:H2	5:B:1269:HOH:O	2.10	0.52
3:A:903:DPF:H12	5:A:1436:HOH:O	2.10	0.52
1:B:36:ARG:HG3	1:B:46:ILE:HG12	1.98	0.45
1:A:57:HIS:NE2	3:A:903:DPF:H11	2.32	0.44
1:A:314:MET:HB2	5:A:1271:HOH:O	2.18	0.43
1:B:46:ILE:HG23	1:B:355:ALA:HB1	2.02	0.42
1:A:271:ILE:HG21	3:A:903:DPF:H33	2.03	0.41
1:A:328:ILE:HD13	1:A:332:VAL:HG21	2.03	0.41
1:B:57:HIS:CD2	3:B:902:DPF:H42	2.56	0.40

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	316/327 (97%)	302 (96%)	14 (4%)	0	100	100
1	B	318/327 (97%)	302 (95%)	16 (5%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	634/654 (97%)	604 (95%)	30 (5%)	0	100	100

There are no Ramachandran outliers to report.

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	257/262 (98%)	250 (97%)	7 (3%)	44	28
1	B	259/262 (99%)	255 (98%)	4 (2%)	65	53
All	All	516/524 (98%)	505 (98%)	11 (2%)	53	38

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	51	PHE
1	A	152	ARG
1	A	178	PRO
1	A	299	SER
1	A	306	PHE
1	A	314	MET
1	A	361	THR
1	B	47	SER
1	B	140	LEU
1	B	299	SER
1	B	306	PHE

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

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

2 non-standard protein/DNA/RNA residues 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	$\# Z > 2$
1	KCX	A	169	1,4	7,11,12	0.50	0	4,12,14	0.56	0
1	KCX	B	169	1,4	7,11,12	0.54	0	4,12,14	0.46	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
1	KCX	A	169	1,4	-	0/7/10/12	-
1	KCX	B	169	1,4	-	0/7/10/12	-

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.

5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

5.6 Ligand geometry ⓘ

Of 7 ligands modelled in this entry, 4 are monoatomic - leaving 3 for Mogul analysis.

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	901	-	3,5,5	0.21	0	4,5,5	0.84	0
3	DPF	A	903	4	8,8,8	0.75	0	9,10,10	0.47	0
3	DPF	B	902	4	8,8,8	0.77	0	9,10,10	0.42	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	901	-	-	-	0/1/1/1
3	DPF	A	903	4	-	0/8/8/8	-
3	DPF	B	902	4	-	4/8/8/8	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	902	DPF	C1-O3-P1-O2
3	B	902	DPF	C4-C1-O3-P1
3	B	902	DPF	C1-O3-P1-O1
3	B	902	DPF	C2-O1-P1-O3

There are no ring outliers.

3 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	901	IMD	2	0
3	A	903	DPF	4	0
3	B	902	DPF	3	0

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, 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	320/327 (97%)	0.43	17 (5%) 26 25	13, 22, 49, 77	0
1	B	322/327 (98%)	0.89	49 (15%) 2 2	16, 32, 59, 72	0
All	All	642/654 (98%)	0.66	66 (10%) 6 6	13, 27, 55, 77	0

All (66) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	271	ILE	11.5
1	A	266	ALA	10.1
1	A	265	ASN	8.8
1	B	260	ILE	6.8
1	A	270	ALA	5.8
1	A	274	ASN	5.4
1	A	267	SER	5.3
1	A	269	SER	5.2
1	A	268	ALA	4.9
1	B	46	ILE	4.5
1	B	288	ILE	4.5
1	B	361	THR	4.0
1	B	274	ASN	3.9
1	B	266	ALA	3.8
1	B	37	ILE	3.7
1	B	328	ILE	3.7
1	B	35	ASP	3.6
1	B	346	LEU	3.6
1	B	341	VAL	3.6
1	A	319	ARG	3.5
1	B	358	LEU	3.4
1	B	293	MET	3.4
1	A	340	GLY	3.3
1	A	361	THR	3.3

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Mol	Chain	Res	Type	RSRZ
1	B	335	PHE	3.1
1	B	342	PRO	3.1
1	B	337	ARG	3.0
1	B	334	PRO	3.0
1	B	343	GLN	3.0
1	B	124	ILE	2.9
1	B	270	ALA	2.9
1	A	312	ASN	2.7
1	B	40	VAL	2.7
1	B	286	ALA	2.7
1	B	336	LEU	2.6
1	B	98	ILE	2.6
1	B	352	THR	2.5
1	B	296	ILE	2.5
1	B	340	GLY	2.5
1	B	89	ARG	2.4
1	B	292	TYR	2.4
1	B	265	ASN	2.3
1	A	316	VAL	2.3
1	B	330	LEU	2.3
1	B	51	PHE	2.3
1	B	39	THR	2.3
1	B	319	ARG	2.2
1	B	244	ALA	2.2
1	B	332	VAL	2.2
1	A	311	THR	2.2
1	B	167	ILE	2.2
1	B	47	SER	2.1
1	B	327	PHE	2.1
1	B	113	LEU	2.1
1	A	309	TYR	2.1
1	B	277	TRP	2.1
1	B	125	VAL	2.1
1	B	53	LEU	2.1
1	B	271	ILE	2.1
1	B	312	ASN	2.1
1	B	49	ALA	2.1
1	B	311	THR	2.0
1	A	344	GLU	2.0
1	B	324	GLY	2.0
1	A	335	PHE	2.0
1	B	38	ASN	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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(\AA^2)	Q<0.9
1	KCX	B	169	12/13	0.90	0.14	22,24,24,25	0
1	KCX	A	169	12/13	0.92	0.11	14,17,20,20	0

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. 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(\AA^2)	Q<0.9
3	DPF	A	903	9/9	0.89	0.20	30,33,40,42	0
2	IMD	A	901	5/5	0.91	0.13	29,30,30,30	0
3	DPF	B	902	9/9	0.93	0.14	32,38,41,43	0
4	CO	A	801	1/1	0.99	0.02	22,22,22,22	0
4	CO	B	803	1/1	0.99	0.05	24,24,24,24	0
4	CO	B	804	1/1	0.99	0.05	26,26,26,26	0
4	CO	A	802	1/1	1.00	0.03	18,18,18,18	0

6.5 Other polymers [i](#)

There are no such residues in this entry.