



Full wwPDB X-ray Structure Validation Report ⓘ

Sep 4, 2023 – 04:11 PM EDT

PDB ID : 3URA
Title : Crystal Structure of PTE mutant H254G/H257W/L303T/K185R/I274N/A80V/S61T
Authors : Tsai, P.; Fox, N.G.; Li, Y.; Barondeau, D.P.; Raushel, F.M.
Deposited on : 2011-11-21
Resolution : 1.88 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 types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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 : 2.35
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) : 2.35

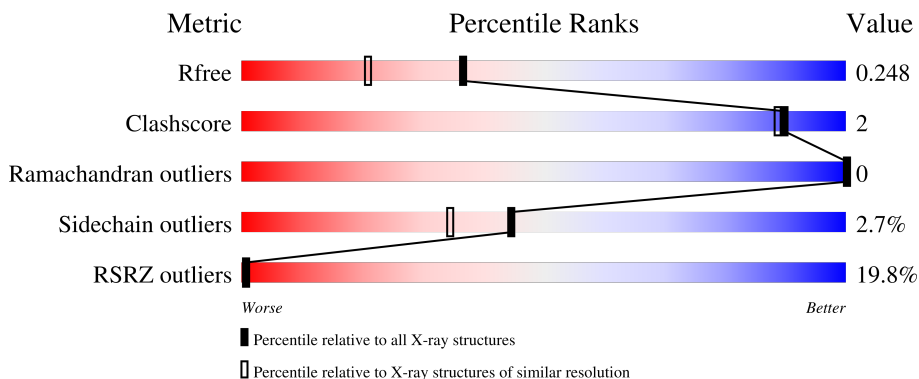
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.88 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	9470 (1.90-1.86)
Clashscore	141614	10282 (1.90-1.86)
Ramachandran outliers	138981	10152 (1.90-1.86)
Sidechain outliers	138945	10152 (1.90-1.86)
RSRZ outliers	127900	9303 (1.90-1.86)

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 $\leq 5\%$. 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	 2% 95%
1	B	327	 38% 89% 9%

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 5351 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
			Total	C	N	O	S			
1	A	327	Total	C	N	O	S	0	0	0
			2504	1582	444	471	7			
1	B	322	Total	C	N	O	S	0	0	0
			2467	1561	439	460	7			

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	61	THR	SER	engineered mutation	UNP P0A434
A	80	VAL	ALA	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	274	ASN	ILE	engineered mutation	UNP P0A434
A	303	THR	LEU	engineered mutation	UNP P0A434
B	61	THR	SER	engineered mutation	UNP P0A434
B	80	VAL	ALA	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	274	ASN	ILE	engineered mutation	UNP P0A434
B	303	THR	LEU	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 COBALT (II) ION (three-letter code: CO) (formula: Co).

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

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	279	Total	O	0	0
			279	279		
4	B	92	Total	O	0	0
			92	92		

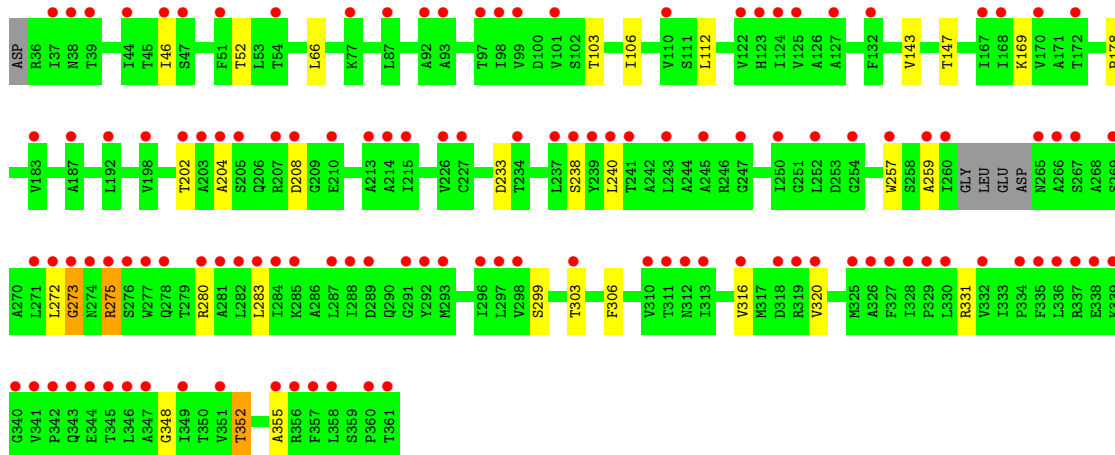
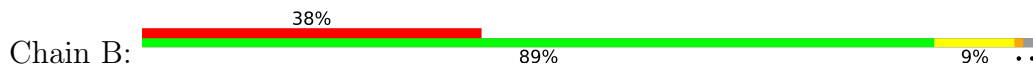
3 Residue-property plots [i](#)

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: 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	85.21Å 85.52Å 88.14Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 1.88 39.17 – 1.89	Depositor EDS
% Data completeness (in resolution range)	98.2 (50.00-1.88) 99.3 (39.17-1.89)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.11	Depositor
$\langle I/\sigma(I) \rangle$ ¹	9.26 (at 1.88Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.232 , 0.253 0.228 , 0.248	Depositor DCC
R_{free} test set	2662 reflections (5.11%)	wwPDB-VP
Wilson B-factor (Å ²)	28.5	Xtriage
Anisotropy	0.413	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 35.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	0.025 for -h,l,k 0.023 for -l,-k,-h 0.023 for k,h,-l 0.012 for k,l,h 0.012 for l,h,k	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	5351	wwPDB-VP
Average B, all atoms (Å ²)	42.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.09% 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: KCX, CO, 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	0.63	0/2539	0.76	2/3449 (0.1%)
1	B	0.62	0/2501	0.76	1/3396 (0.0%)
All	All	0.62	0/5040	0.76	3/6845 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	203	ALA	N-CA-C	-6.55	93.32	111.00
1	B	273	GLY	N-CA-C	5.49	126.83	113.10
1	A	253	ASP	N-CA-C	5.04	124.62	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	2504	0	2512	4	0
1	B	2467	0	2483	14	0
2	A	5	0	5	0	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
4	A	279	0	0	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	92	0	0	3	0
All	All	5351	0	5000	18	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 2.

All (18) 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:B:202:THR:HG23	1:B:208:ASP:HB2	1.79	0.64
1:B:275:ARG:HH12	1:B:280:ARG:HE	1.56	0.54
1:B:143:VAL:O	1:B:147:THR:HG23	2.08	0.53
1:B:283:LEU:HD13	4:B:1247:HOH:O	2.12	0.50
1:A:36:ARG:HH21	1:A:45:THR:HG23	1.76	0.49
1:B:46:ILE:HG23	1:B:355:ALA:HB1	1.95	0.48
1:B:259:ALA:HB3	1:B:273:GLY:O	2.15	0.46
1:B:257:TRP:O	1:B:280:ARG:NH1	2.49	0.46
1:B:348:GLY:HA2	1:B:352:THR:HG23	1.97	0.45
1:A:252:LEU:HD11	1:A:287:LEU:HD12	2.00	0.44
1:B:316:VAL:O	1:B:320:VAL:HG23	2.17	0.44
1:B:66:LEU:HD21	1:B:112:LEU:HD22	1.99	0.43
1:B:240:LEU:HD11	4:B:1247:HOH:O	2.18	0.42
1:A:259:ALA:HB2	1:A:272:LEU:HB2	2.02	0.41
1:B:204:ALA:HB3	1:B:233:ASP:HB2	2.03	0.41
1:A:61:THR:HG23	1:A:107:GLY:HA3	2.02	0.41
1:B:103:THR:H	1:B:106:ILE:HD12	1.85	0.40
1:B:238:SER:HB2	4:B:1282:HOH:O	2.21	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	324/327 (99%)	312 (96%)	12 (4%)	0	100	100
1	B	317/327 (97%)	297 (94%)	20 (6%)	0	100	100
All	All	641/654 (98%)	609 (95%)	32 (5%)	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	262/262 (100%)	257 (98%)	5 (2%)	57	49
1	B	258/262 (98%)	249 (96%)	9 (4%)	36	24
All	All	520/524 (99%)	506 (97%)	14 (3%)	44	34

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	36	ARG
1	A	262	LEU
1	A	299	SER
1	A	306	PHE
1	A	361	THR
1	B	52	THR
1	B	178	PRO
1	B	272	LEU
1	B	275	ARG
1	B	299	SER
1	B	303	THR
1	B	306	PHE
1	B	331	ARG
1	B	352	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	155	GLN
1	B	290	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](#)

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	B	169	1,3	9,11,12	0.92	1 (11%)	5,12,14	2.07	1 (20%)
1	KCX	A	169	1,3	9,11,12	0.82	0	5,12,14	2.24	1 (20%)

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	B	169	1,3	-	0/9/10/12	-
1	KCX	A	169	1,3	-	0/9/10/12	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	169	KCX	OQ1-CX	2.10	1.25	1.21

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	169	KCX	OQ1-CX-NZ	-4.78	117.54	124.96

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	169	KCX	OQ1-CX-NZ	-4.44	118.07	124.96

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 [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 5 ligands modelled in this entry, 4 are monoatomic - leaving 1 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	1372	-	3,5,5	0.23	0	4,5,5	0.82	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	1372	-	-	-	0/1/1/1

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

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	326/327 (99%)	0.13	5 (1%) 73 75	17, 26, 44, 63	0
1	B	321/327 (98%)	1.78	123 (38%) 0 0	26, 58, 76, 82	0
All	All	647/654 (98%)	0.94	128 (19%) 1 1	17, 39, 74, 82	0

All (128) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	245	ALA	7.1
1	B	282	LEU	6.4
1	B	259	ALA	6.1
1	B	241	THR	5.8
1	B	288	ILE	5.6
1	B	335	PHE	5.5
1	B	347	ALA	5.4
1	B	272	LEU	5.2
1	B	293	MET	5.0
1	B	298	VAL	5.0
1	B	346	LEU	4.9
1	B	274	ASN	4.8
1	B	330	LEU	4.7
1	B	341	VAL	4.7
1	A	361	THR	4.6
1	B	271	LEU	4.5
1	B	292	TYR	4.4
1	B	254	GLY	4.4
1	B	269	SER	4.2
1	B	281	ALA	4.1
1	B	337	ARG	4.1
1	B	342	PRO	4.0
1	B	260	ILE	3.9
1	B	277	TRP	3.9

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	198	VAL	3.7
1	B	239	TYR	3.6
1	B	339	LYS	3.6
1	B	51	PHE	3.6
1	B	240	LEU	3.5
1	B	338	GLU	3.5
1	B	98	ILE	3.5
1	B	213	ALA	3.5
1	B	204	ALA	3.4
1	B	297	LEU	3.4
1	B	289	ASP	3.4
1	B	296	ILE	3.4
1	B	326	ALA	3.3
1	B	266	ALA	3.2
1	B	328	ILE	3.2
1	B	287	LEU	3.2
1	B	334	PRO	3.2
1	B	312	ASN	3.2
1	B	77	LYS	3.2
1	B	252	LEU	3.1
1	B	125	VAL	3.1
1	B	336	LEU	3.1
1	B	340	GLY	3.1
1	B	257	TRP	3.1
1	B	203	ALA	3.1
1	B	205	SER	3.0
1	B	237	LEU	3.0
1	B	327	PHE	3.0
1	B	319	ARG	3.0
1	B	127	ALA	3.0
1	B	283	LEU	2.9
1	B	192	LEU	2.9
1	B	167	ILE	2.9
1	B	238	SER	2.8
1	B	329	PRO	2.8
1	B	99	VAL	2.8
1	B	276	SER	2.8
1	B	356	ARG	2.8
1	B	320	VAL	2.8
1	B	332	VAL	2.8
1	B	122	VAL	2.7
1	B	227	CYS	2.7

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	214	ALA	2.7
1	B	355	ALA	2.7
1	B	318	ASP	2.6
1	A	125	VAL	2.6
1	B	343	GLN	2.6
1	B	54	THR	2.6
1	B	273	GLY	2.6
1	B	37	ILE	2.6
1	B	291	GLY	2.5
1	B	303	THR	2.5
1	A	312	ASN	2.5
1	B	285	LYS	2.5
1	B	357	PHE	2.5
1	B	97	THR	2.5
1	B	325	MET	2.5
1	B	349	ILE	2.4
1	B	226	VAL	2.4
1	B	38	ASN	2.4
1	B	243	LEU	2.4
1	B	44	ILE	2.4
1	B	344	GLU	2.4
1	B	132	PHE	2.4
1	B	361	THR	2.4
1	B	202	THR	2.4
1	B	46	ILE	2.4
1	B	168	ILE	2.4
1	B	208	ASP	2.3
1	B	124	ILE	2.3
1	B	275	ARG	2.3
1	B	207	ARG	2.3
1	B	280	ARG	2.3
1	B	110	VAL	2.3
1	B	351	VAL	2.3
1	A	266	ALA	2.3
1	B	93	ALA	2.3
1	B	345	THR	2.3
1	B	265	ASN	2.2
1	B	47	SER	2.2
1	B	210	GLU	2.2
1	B	87	LEU	2.2
1	B	358	LEU	2.2
1	A	338	GLU	2.2

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	101	VAL	2.2
1	B	215	ILE	2.2
1	B	313	ILE	2.2
1	B	234	THR	2.2
1	B	267	SER	2.2
1	B	360	PRO	2.2
1	B	92	ALA	2.2
1	B	187	ALA	2.2
1	B	39	THR	2.1
1	B	278	GLN	2.1
1	B	316	VAL	2.1
1	B	123	HIS	2.1
1	B	170	VAL	2.1
1	B	183	VAL	2.1
1	B	250	ILE	2.1
1	B	310	VAL	2.1
1	B	284	ILE	2.1
1	B	247	GLY	2.1
1	B	311	THR	2.0
1	B	172	THR	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(Å ²)	Q<0.9
1	KCX	B	169	12/13	0.86	0.23	45,46,48,51	0
1	KCX	A	169	12/13	0.96	0.11	14,17,22,23	0

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(\AA^2)	Q<0.9
2	IMD	A	1372	5/5	0.85	0.22	33,33,35,36	0
3	CO	B	804	1/1	0.93	0.04	57,57,57,57	0
3	CO	B	803	1/1	0.96	0.05	48,48,48,48	0
3	CO	A	801	1/1	0.99	0.03	22,22,22,22	0
3	CO	A	802	1/1	0.99	0.08	21,21,21,21	0

6.5 Other polymers [i](#)

There are no such residues in this entry.