



# Full wwPDB X-ray Structure Validation Report

Mar 1, 2014 – 01:24 AM GMT

PDB ID : 3PB1  
Title : Crystal Structure of a Michaelis Complex between Plasminogen Activator Inhibitor-1 and Urokinase-type Plasminogen Activator  
Authors : Lin, Z.; Jiang, L.; Huang, M.  
Deposited on : 2010-10-20  
Resolution : 2.30 Å(reported)

This is a full wwPDB 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/ValidationPDFNotes.html>

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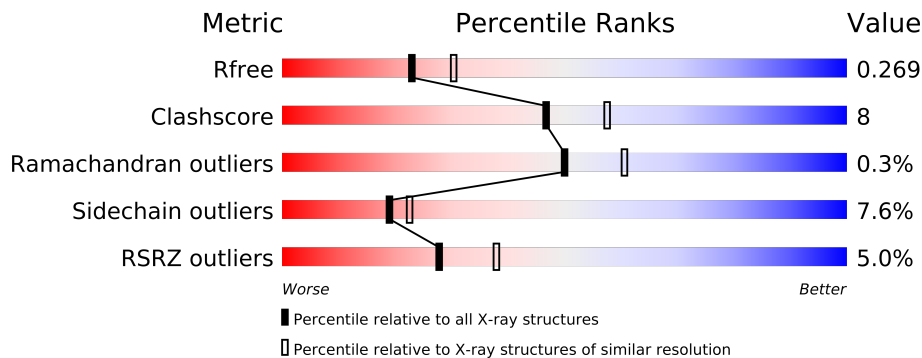
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.15 2013  
Xtriage (Phenix) : dev-1323  
EDS : stable22639  
Percentile statistics : 21963  
Refmac : 5.8.0049  
CCP4 : 6.3.0 (Settle)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)  
Validation Pipeline (wwPDB-VP) : stable22683

# 1 Overall quality at a glance

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))
$R_{free}$	66092	2929 (2.30-2.30)
Clashscore	79885	3679 (2.30-2.30)
Ramachandran outliers	78287	3642 (2.30-2.30)
Sidechain outliers	78261	3641 (2.30-2.30)
RSRZ outliers	66119	2930 (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  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	I	379	
2	E	253	

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 5250 atoms, of which 0 are hydrogen and 0 are deuterium.

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 Plasminogen activator inhibitor 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	I	375	2977	1911	508	543	15	0	0	0

There are 5 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
I	150	HIS	ASN	ENGINEERED MUTATION	UNP P05121
I	154	THR	LYS	ENGINEERED MUTATION	UNP P05121
I	158	GLN	ASP	CONFLICT	UNP P05121
I	319	LEU	GLN	ENGINEERED MUTATION	UNP P05121
I	354	ILE	MET	ENGINEERED MUTATION	UNP P05121

- Molecule 2 is a protein called Plasminogen activator, urokinase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	E	247	1949	1231	341	362	15	0	0	0

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
E	122	ALA	CYS	CONFLICT	UNP Q5SWW8
E	145	GLN	ASN	CONFLICT	UNP Q5SWW8
E	195	ALA	SER	ENGINEERED MUTATION	UNP Q5SWW8

- Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	E	1	Total	O	S	0	0
			5	4	1		
3	E	1	Total	O	S	0	0
			5	4	1		

- Molecule 4 is water.

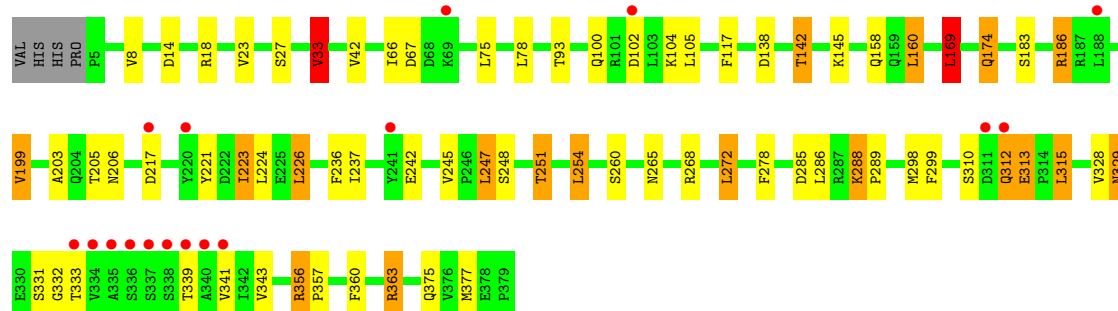
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	I	219	Total	O	0	0
			219	219		
4	E	95	Total	O	0	0
			95	95		

### 3 Residue-property plots

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 ( $RSRZ > 2$ ). 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.

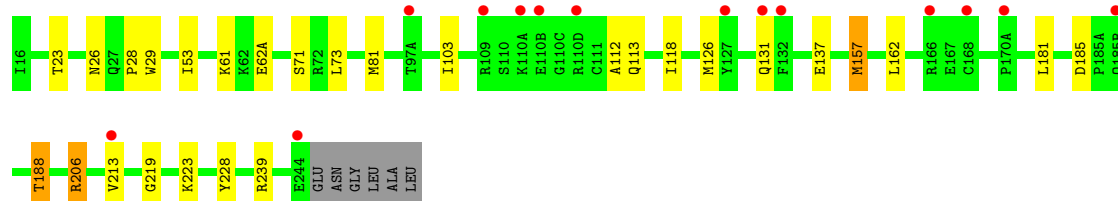
- Molecule 1: Plasminogen activator inhibitor 1

Chain I: 



- Molecule 2: Plasminogen activator, urokinase

Chain E: 



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	97.71Å 97.71Å 171.92Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	38.32 – 2.30 38.32 – 2.30	Depositor EDS
% Data completeness (in resolution range)	99.1 (38.32-2.30) 99.1 (38.32-2.30)	Depositor EDS
$R_{merge}$	0.16	Depositor
$R_{sym}$	0.18	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.86 (at 2.29Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, $R_{free}$	0.220 , 0.272 0.218 , 0.269	Depositor DCC
$R_{free}$ test set	2142 reflections (5.31%)	DCC
Wilson B-factor (Å <sup>2</sup> )	28.0	Xtriage
Anisotropy	0.102	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 22.3	EDS
Estimated twinning fraction	0.024 for -h,-k,l	Xtriage
L-test for twinning	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 42480 reflections	Xtriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	5250	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.28% of the height of the origin peak. No significant pseudotranslation is detected.*

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

## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: SO4

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	I	0.47	0/3049	0.66	2/4136 (0.0%)
2	E	0.46	0/1998	0.57	0/2707
All	All	0.46	0/5047	0.62	2/6843 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	I	0	1

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	I	169	LEU	CA-CB-CG	7.30	132.10	115.30
1	I	33	VAL	CB-CA-C	-5.04	101.82	111.40

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	I	313	GLU	Peptide

### 5.2 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 hydrogens

added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	I	2977	0	2979	58	0
2	E	1949	0	1901	21	0
3	E	10	0	0	0	0
4	E	95	0	0	1	0
4	I	219	0	0	10	0
All	All	5250	0	4880	79	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 8.

All (79) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
2:E:206:ARG:HH11	2:E:206:ARG:HG2	1.19	1.08
1:I:268:ARG:HH22	1:I:341:VAL:HG21	1.22	1.00
1:I:224:LEU:HB3	4:I:537:HOH:O	1.62	0.98
1:I:288:LYS:H	1:I:288:LYS:HD2	1.35	0.88
2:E:137:GLU:HB3	2:E:157:MET:HE1	1.56	0.88
1:I:14:ASP:OD1	1:I:18:ARG:NH1	2.13	0.81
1:I:375:GLN:HB2	1:I:377:MET:HE3	1.66	0.77
1:I:226:LEU:HD13	4:I:537:HOH:O	1.84	0.76
2:E:185:ASP:HB2	2:E:188:THR:HG22	1.67	0.76
1:I:251:THR:HA	1:I:254:LEU:HD22	1.71	0.73
2:E:137:GLU:HB3	2:E:157:MET:CE	2.18	0.73
1:I:142:THR:HG22	4:I:460:HOH:O	1.89	0.72
1:I:205:THR:HG22	1:I:272:LEU:HB2	1.71	0.70
1:I:206:ASN:HA	1:I:343:VAL:HG23	1.72	0.70
2:E:206:ARG:HG2	2:E:206:ARG:NH1	1.98	0.67
2:E:206:ARG:CG	2:E:206:ARG:HH11	2.03	0.67
1:I:247:LEU:HD12	1:I:377:MET:HE3	1.77	0.65
1:I:93:THR:HG22	1:I:169:LEU:HD13	1.79	0.65
1:I:100:GLN:HE21	1:I:102:ASP:HB2	1.60	0.64
2:E:137:GLU:CB	2:E:157:MET:HE1	2.25	0.64
1:I:251:THR:HG21	4:I:438:HOH:O	1.96	0.63
1:I:221:TYR:CE1	1:I:223:ILE:HD11	2.33	0.63
1:I:33:VAL:HG13	1:I:360:PHE:HZ	1.63	0.62
1:I:313:GLU:HB2	1:I:315:LEU:HB2	1.80	0.62
1:I:242:GLU:HG2	4:I:412:HOH:O	2.01	0.61
1:I:247:LEU:HD12	1:I:377:MET:CE	2.31	0.60

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:I:142:THR:HG21	4:I:524:HOH:O	2.02	0.60
1:I:268:ARG:NH2	1:I:341:VAL:HG21	2.05	0.59
1:I:158:GLN:HE21	1:I:160:LEU:HB2	1.68	0.59
1:I:158:GLN:HG3	1:I:160:LEU:H	1.67	0.58
1:I:357:PRO:HB3	1:I:377:MET:HE1	1.86	0.57
2:E:81:MET:HE3	2:E:112:ALA:HA	1.84	0.57
2:E:23:THR:OG1	2:E:26:ASN:ND2	2.38	0.57
1:I:298:MET:HE2	1:I:299:PHE:CE2	2.40	0.56
1:I:375:GLN:HB2	1:I:377:MET:CE	2.35	0.56
1:I:288:LYS:HB2	1:I:289:PRO:HD3	1.90	0.54
2:E:81:MET:CE	2:E:118:ILE:HD13	2.37	0.54
1:I:310:SER:O	1:I:313:GLU:OE1	2.25	0.53
1:I:236:PHE:O	1:I:360:PHE:HA	2.09	0.53
1:I:138:ASP:O	1:I:142:THR:HG23	2.09	0.52
1:I:221:TYR:HE1	1:I:223:ILE:HD11	1.72	0.52
1:I:186:ARG:CG	1:I:186:ARG:HH11	2.23	0.51
1:I:312:GLN:HB3	4:I:559:HOH:O	2.10	0.51
1:I:288:LYS:H	1:I:288:LYS:CD	2.14	0.51
1:I:329:ASN:HD22	1:I:331:SER:H	1.58	0.51
2:E:81:MET:CE	2:E:113:GLN:H	2.25	0.50
1:I:186:ARG:HG2	1:I:186:ARG:HH11	1.77	0.49
1:I:268:ARG:HH22	1:I:341:VAL:CG2	2.10	0.49
2:E:61:LYS:HG2	2:E:62(A):GLU:OE1	2.12	0.49
1:I:245:VAL:O	1:I:356:ARG:NH2	2.41	0.49
1:I:248:SER:HA	1:I:251:THR:HG23	1.95	0.48
1:I:226:LEU:HD22	1:I:237:ILE:HD13	1.95	0.48
2:E:81:MET:HE2	2:E:118:ILE:HD13	1.96	0.48
1:I:93:THR:CG2	1:I:169:LEU:HD13	2.44	0.47
1:I:205:THR:HG21	4:E:268:HOH:O	2.13	0.47
1:I:285:ASP:CG	1:I:288:LYS:NZ	2.68	0.47
2:E:126:MET:HE3	2:E:239:ARG:HH21	1.80	0.46
1:I:206:ASN:HB2	4:I:556:HOH:O	2.15	0.45
1:I:226:LEU:HD22	1:I:237:ILE:CD1	2.46	0.45
2:E:213:VAL:HG22	2:E:228:TYR:HE2	1.81	0.45
1:I:285:ASP:CG	1:I:288:LYS:HZ3	2.21	0.45
1:I:206:ASN:HA	1:I:343:VAL:CG2	2.45	0.45
1:I:278:PHE:CZ	1:I:328:VAL:HG21	2.52	0.44
1:I:260:SER:HB3	1:I:363:ARG:HH22	1.83	0.44
1:I:183:SER:HB3	1:I:203:ALA:HB3	2.01	0.43
2:E:206:ARG:CG	2:E:206:ARG:NH1	2.69	0.43
2:E:157:MET:HE2	2:E:157:MET:HB2	1.86	0.43
2:E:28:PRO:HD2	2:E:29:TRP:CZ3	2.55	0.42

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:I:272:LEU:C	1:I:272:LEU:HD12	2.40	0.42
1:I:298:MET:CE	1:I:299:PHE:CE2	3.03	0.42
2:E:126:MET:CE	2:E:239:ARG:HH21	2.33	0.42
1:I:67:ASP:HB2	4:I:557:HOH:O	2.20	0.42
2:E:53:ILE:HD11	2:E:103:ILE:HD11	2.02	0.41
1:I:313:GLU:HG3	1:I:313:GLU:O	2.20	0.41
1:I:186:ARG:CG	1:I:186:ARG:NH1	2.83	0.41
1:I:66:ILE:HG12	1:I:117:PHE:HZ	1.84	0.41
2:E:81:MET:HE1	2:E:118:ILE:HD13	2.02	0.41
1:I:174:GLN:HG3	1:I:332:GLY:HA2	2.03	0.40
1:I:199:VAL:HG13	4:I:441:HOH:O	2.20	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles

### 5.3.1 Protein backbone ⓘ

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	I	373/379 (98%)	364 (98%)	8 (2%)	1 (0%)	50	60
2	E	245/253 (97%)	238 (97%)	6 (2%)	1 (0%)	43	52
All	All	618/632 (98%)	602 (97%)	14 (2%)	2 (0%)	50	60

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	I	339	THR
2	E	219	GLY

### 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	I	329/333 (99%)	297 (90%)	32 (10%)	12	13
2	E	214/218 (98%)	205 (96%)	9 (4%)	40	53
All	All	543/551 (98%)	502 (92%)	41 (8%)	19	22

All (41) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	I	8	VAL
1	I	23	VAL
1	I	27	SER
1	I	33	VAL
1	I	42	VAL
1	I	75	LEU
1	I	78	LEU
1	I	104	LYS
1	I	105	LEU
1	I	142	THR
1	I	145	LYS
1	I	160	LEU
1	I	169	LEU
1	I	174	GLN
1	I	186	ARG
1	I	199	VAL
1	I	217	ASP
1	I	223	ILE
1	I	226	LEU
1	I	247	LEU
1	I	251	THR
1	I	254	LEU
1	I	265	ASN
1	I	272	LEU
1	I	286	LEU
1	I	288	LYS
1	I	312	GLN
1	I	315	LEU
1	I	329	ASN
1	I	333	THR
1	I	356	ARG
1	I	363	ARG
2	E	71	SER
2	E	73	LEU
2	E	131	GLN

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Mol	Chain	Res	Type
2	E	157	MET
2	E	162	LEU
2	E	181	LEU
2	E	188	THR
2	E	206	ARG
2	E	223	LYS

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

Mol	Chain	Res	Type
1	I	107	GLN
1	I	112	HIS
1	I	172	ASN
1	I	265	ASN
1	I	292	ASN
1	I	329	ASN
1	I	375	GLN
2	E	26	ASN
2	E	37	HIS
2	E	99	HIS

### 5.3.3 RNA ⓘ

There are no RNA chains 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	$\# Z  > 2$
3	SO4	E	1	-	4,4,4	0.22	0	6,6,6	0.06	0
3	SO4	E	2	-	4,4,4	0.19	0	6,6,6	0.17	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
3	SO4	E	1	-	-	0/0/0/0	0/0/0/0
3	SO4	E	2	-	-	0/0/0/0	0/0/0/0

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.

## 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	I	375/379 (98%)	0.08	17 (4%)	32 42	13, 23, 39, 58	2 (0%)
2	E	247/253 (97%)	0.38	14 (5%)	23 32	16, 32, 48, 54	0
All	All	622/632 (98%)	0.20	31 (4%)	28 38	13, 26, 44, 58	2 (0%)

All (31) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	I	339	THR	7.7
1	I	337	SER	7.5
1	I	335	ALA	6.1
1	I	338	SER	5.7
1	I	334	VAL	5.3
2	E	244	GLU	4.7
1	I	336	SER	4.1
1	I	333	THR	3.9
1	I	340	ALA	3.6
2	E	132	PHE	3.6
1	I	341	VAL	3.5
2	E	166	ARG	3.3
2	E	110(B)	GLU	3.3
2	E	97(A)	THR	3.1
1	I	312	GLN	3.0
1	I	241	TYR	3.0
2	E	168	CYS	2.9
1	I	102	ASP	2.6
2	E	131	GLN	2.5
2	E	109	ARG	2.5
2	E	127	TYR	2.5
2	E	110(A)	LYS	2.4
1	I	311	ASP	2.3
2	E	213	VAL	2.1

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Mol	Chain	Res	Type	RSRZ
2	E	185(B)	GLN	2.1
1	I	188	LEU	2.1
2	E	110(D)	ARG	2.1
1	I	220	TYR	2.1
1	I	69	LYS	2.0
2	E	170(A)	PRO	2.0
1	I	217	ASP	2.0

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

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

## 6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 6.4 Ligands ⓘ

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	RSR	LLDF	B-factors(Å <sup>2</sup> )	Q<0.9
3	SO4	E	2	5/5	0.20	-	62,62,62,62	0
3	SO4	E	1	5/5	0.07	-	48,48,49,49	0

## 6.5 Other polymers ⓘ

There are no such residues in this entry.