



# Full wwPDB X-ray Structure Validation Report ⓘ

May 25, 2020 – 08:26 am BST

PDB ID : 5YJE  
Title : Crystal structure of HIRA(644-1017)  
Authors : Sato, Y.; Senda, M.; Senda, T.  
Deposited on : 2017-10-10  
Resolution : 2.45 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

<https://www.wwpdb.org/validation/2017/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 : 1.8.5 (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

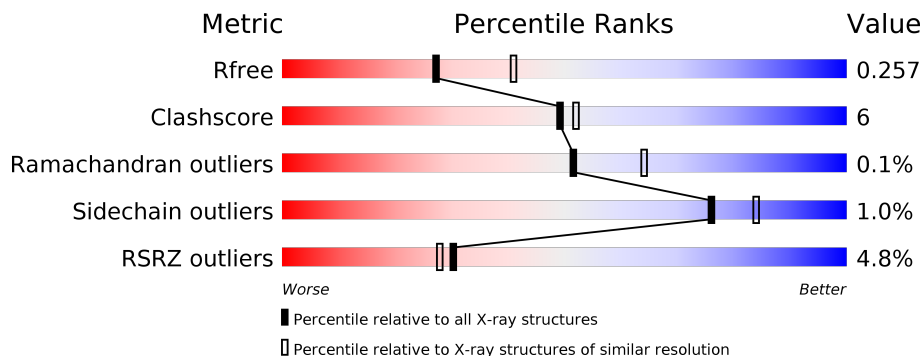
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.45 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	1544 (2.48-2.44)
Clashscore	141614	1613 (2.48-2.44)
Ramachandran outliers	138981	1598 (2.48-2.44)
Sidechain outliers	138945	1598 (2.48-2.44)
RSRZ outliers	127900	1523 (2.48-2.44)

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 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	380	
1	B	380	
1	C	380	

## 2 Entry composition i

There are 3 unique types of molecules in this entry. The entry contains 6838 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 Protein HIRA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	315	2318	1475	395	433	15	0	0	0
1	B	318	2295	1466	387	426	16	0	1	0
1	C	299	2194	1399	376	405	14	0	0	0

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	643	MET	-	initiating methionine	UNP P54198
A	1018	LEU	-	see sequence details	UNP P54198
A	1019	GLU	-	see sequence details	UNP P54198
A	1020	GLY	-	see sequence details	UNP P54198
A	1021	SER	-	see sequence details	UNP P54198
A	1022	SER	-	see sequence details	UNP P54198
B	643	MET	-	initiating methionine	UNP P54198
B	1018	LEU	-	see sequence details	UNP P54198
B	1019	GLU	-	see sequence details	UNP P54198
B	1020	GLY	-	see sequence details	UNP P54198
B	1021	SER	-	see sequence details	UNP P54198
B	1022	SER	-	see sequence details	UNP P54198
C	643	MET	-	initiating methionine	UNP P54198
C	1018	LEU	-	see sequence details	UNP P54198
C	1019	GLU	-	see sequence details	UNP P54198
C	1020	GLY	-	see sequence details	UNP P54198
C	1021	SER	-	see sequence details	UNP P54198
C	1022	SER	-	see sequence details	UNP P54198

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).

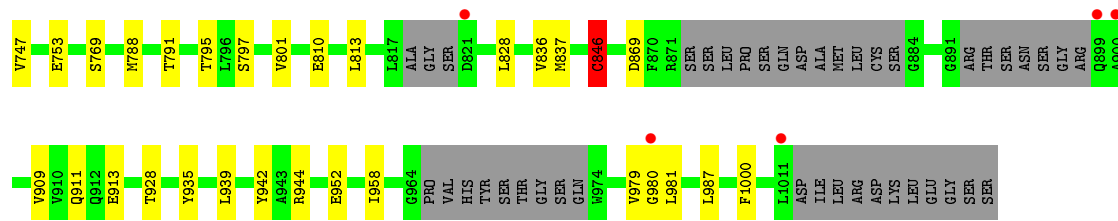


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		
2	C	1	Total	O	S	0	0
			5	4	1		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	3	Total	O	0	0
			3	3		
3	B	11	Total	O	0	0
			11	11		
3	C	2	Total	O	0	0
			2	2		





## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	149.99Å 86.80Å 99.15Å 90.00° 102.49° 90.00°	Depositor
Resolution (Å)	19.81 – 2.45 19.81 – 2.45	Depositor EDS
% Data completeness (in resolution range)	99.7 (19.81-2.45) 99.9 (19.81-2.45)	Depositor EDS
$R_{merge}$	0.04	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	5.16 (at 2.44Å)	Xtrriage
Refinement program	PHENIX (1.12_2829: ???)	Depositor
R, $R_{free}$	0.202 , 0.256 0.203 , 0.257	Depositor DCC
$R_{free}$ test set	2000 reflections (4.38%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	52.6	Xtrriage
Anisotropy	0.419	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 51.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	6838	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	59.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.94% 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, 0.333 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: 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	A	0.42	0/2359	0.61	2/3219 (0.1%)
1	B	0.47	2/2337 (0.1%)	0.63	0/3193
1	C	0.45	1/2233 (0.0%)	0.62	2/3045 (0.1%)
All	All	0.45	3/6929 (0.0%)	0.62	4/9457 (0.0%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	979	VAL	CB-CG1	-5.75	1.40	1.52
1	B	782	CYS	CB-SG	-5.27	1.73	1.81
1	C	846	CYS	CB-SG	-5.01	1.73	1.81

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	828	LEU	CA-CB-CG	6.11	129.34	115.30
1	A	990	LEU	CA-CB-CG	5.56	128.09	115.30
1	A	773	LEU	CA-CB-CG	-5.05	103.68	115.30
1	C	944	ARG	NE-CZ-NH1	-5.00	117.80	120.30

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	2318	0	2220	33	0
1	B	2295	0	2204	24	0
1	C	2194	0	2072	23	0
2	A	5	0	0	0	0
2	B	5	0	0	0	0
2	C	5	0	0	0	0
3	A	3	0	0	0	0
3	B	11	0	0	0	0
3	C	2	0	0	0	0
All	All	6838	0	6496	78	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 6.

All (78) 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:869:ASP:OD1	1:A:899:GLN:NE2	2.22	0.72
1:A:885:PRO:O	1:A:889:ILE:HD12	1.90	0.72
1:A:988:LYS:HA	1:A:991:LEU:HD23	1.79	0.64
1:B:885:PRO:O	1:B:889:ILE:HD12	1.99	0.62
1:A:940:LEU:HD23	1:A:990:LEU:HD23	1.80	0.62
1:C:942:TYR:HE2	1:C:958:ILE:HD11	1.64	0.61
1:A:987:LEU:HG	1:A:991:LEU:HD21	1.82	0.61
1:B:836:VAL:HG11	1:B:889:ILE:HG12	1.82	0.60
1:A:753:GLU:O	1:A:755:ARG:N	2.33	0.58
1:B:816:ILE:HD11	1:B:854:TRP:CE3	2.38	0.58
1:C:710:VAL:HG23	1:C:711:THR:HG22	1.85	0.58
1:A:737:ARG:HB2	1:A:753:GLU:HG3	1.86	0.57
1:B:734:LEU:HD13	1:B:738:ILE:HD11	1.87	0.56
1:A:683:LEU:HB2	1:A:792:ALA:HA	1.88	0.56
1:B:774:PRO:HG3	1:B:810:GLU:HG2	1.88	0.56
1:B:942:TYR:HE2	1:B:958:ILE:HD11	1.71	0.55
1:C:836:VAL:HG22	1:C:846:CYS:HB2	1.88	0.55
1:B:932:SER:HA	1:B:979:VAL:CG1	2.38	0.54
1:A:738:ILE:HG23	1:A:750:VAL:HG13	1.89	0.53
1:A:730:TRP:CD1	1:A:763:CYS:HA	2.44	0.52
1:A:909:VAL:O	1:A:913:GLU:HG3	2.10	0.52
1:C:909:VAL:O	1:C:913:GLU:HG3	2.10	0.51
1:C:979:VAL:O	1:C:979:VAL:HG12	2.11	0.51
1:A:924:ALA:O	1:A:928:THR:HG23	2.11	0.51
1:C:697:SER:HB3	1:C:702:MET:HB3	1.92	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:869:ASP:HB2	1:C:911:GLN:HE21	1.77	0.50
1:A:709:GLU:OE2	1:A:737:ARG:HD3	2.12	0.50
1:B:846:CYS:SG	1:B:928:THR:HG22	2.52	0.50
1:A:994:ILE:HG21	1:A:1003:LEU:HD12	1.93	0.49
1:B:976:SER:O	1:B:983:LYS:HG3	2.12	0.49
1:B:788:MET:HA	1:B:797:SER:O	2.13	0.49
1:A:991:LEU:HD11	1:A:1007:CYS:HB2	1.93	0.49
1:A:806:VAL:HB	1:B:851:LEU:O	2.13	0.48
1:A:683:LEU:HD12	1:A:794:ALA:HA	1.94	0.48
1:C:952:GLU:HG3	1:C:1000:PHE:HE1	1.79	0.48
1:B:759:VAL:HG11	1:B:801:VAL:HG11	1.94	0.48
1:B:756:MET:HE2	1:B:770:PRO:HB2	1.95	0.47
1:A:867:CYS:HB2	1:A:914:THR:HG21	1.97	0.47
1:B:747:VAL:HG11	1:B:801:VAL:HG21	1.96	0.47
1:C:702:MET:HA	1:C:724:ASN:O	2.15	0.47
1:B:720:ARG:NH2	1:B:731:GLU:OE2	2.45	0.47
1:C:942:TYR:CE2	1:C:958:ILE:HD11	2.49	0.47
1:C:739:LEU:HD21	1:C:753:GLU:HG3	1.97	0.46
1:A:864:LEU:HD22	1:A:914:THR:HG23	1.96	0.46
1:B:811:GLU:HG3	1:B:847:PHE:CE1	2.51	0.45
1:C:747:VAL:HG11	1:C:801:VAL:HG21	1.97	0.45
1:C:846:CYS:SG	1:C:928:THR:HG22	2.57	0.45
1:B:936:ARG:O	1:B:940:LEU:HG	2.17	0.45
1:A:739:LEU:HD11	1:A:753:GLU:HA	1.99	0.44
1:A:773:LEU:HA	1:A:773:LEU:HD23	1.81	0.44
1:A:884:GLY:O	1:A:888:ILE:HG12	2.17	0.44
1:C:723:CYS:HB3	1:C:730:TRP:CE2	2.52	0.44
1:C:791:THR:OG1	1:C:795:THR:HG22	2.18	0.44
1:B:768:LEU:HD21	1:B:804:GLN:HG2	2.00	0.44
1:B:945:TYR:CZ	1:B:949:GLU:HG3	2.53	0.44
1:C:935:TYR:CE1	1:C:939:LEU:HD12	2.53	0.43
1:C:813:LEU:HD22	1:C:837:MET:HE1	1.99	0.43
1:A:928:THR:HG21	1:C:769:SER:HB2	2.01	0.43
1:A:943:ALA:CB	1:A:990:LEU:HD22	2.48	0.43
1:C:869:ASP:HB2	1:C:911:GLN:NE2	2.34	0.43
1:B:859:ASP:OD2	1:B:862:ASP:HB2	2.19	0.43
1:C:788:MET:HA	1:C:797:SER:O	2.19	0.43
1:C:810:GLU:HG3	1:C:810:GLU:O	2.19	0.42
1:B:683:LEU:HD23	1:B:683:LEU:HA	1.78	0.42
1:A:723:CYS:HB3	1:A:730:TRP:CE2	2.55	0.42
1:A:987:LEU:O	1:A:990:LEU:N	2.52	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:822:MET:HE1	1:A:841:ASP:HB3	2.00	0.42
1:A:841:ASP:OD2	1:A:843:LYS:HD2	2.19	0.42
1:A:696:VAL:HG22	1:A:702:MET:O	2.20	0.42
1:A:882:CYS:N	1:A:893:THR:O	2.53	0.41
1:C:980:GLY:O	1:C:981:LEU:HD23	2.21	0.41
1:C:987:LEU:HA	1:C:987:LEU:HD12	1.88	0.41
1:A:710:VAL:HG21	1:A:720:ARG:HD2	2.02	0.41
1:A:836:VAL:HG22	1:A:846:CYS:HB2	2.02	0.41
1:B:979:VAL:O	1:B:979:VAL:HG12	2.21	0.41
1:B:720:ARG:HH21	1:B:731:GLU:CD	2.23	0.41
1:A:987:LEU:HG	1:A:991:LEU:CD2	2.50	0.40
1:B:865:ALA:HB2	1:B:918:TYR:CE1	2.57	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	307/380 (81%)	290 (94%)	17 (6%)	0	100	100
1	B	311/380 (82%)	293 (94%)	17 (6%)	1 (0%)	41	49
1	C	289/380 (76%)	273 (94%)	16 (6%)	0	100	100
All	All	907/1140 (80%)	856 (94%)	50 (6%)	1 (0%)	51	64

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	699	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	A	238/333 (72%)	235 (99%)	3 (1%)	69	79
1	B	233/333 (70%)	230 (99%)	3 (1%)	69	79
1	C	219/333 (66%)	218 (100%)	1 (0%)	88	93
All	All	690/999 (69%)	683 (99%)	7 (1%)	76	84

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	846	CYS
1	A	852	SER
1	A	928	THR
1	B	693	THR
1	B	822	MET
1	B	852	SER
1	C	846	CYS

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

### 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 carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

3 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	SO4	B	1101	-	4,4,4	0.28	0	6,6,6	0.32	0
2	SO4	C	1101	-	4,4,4	0.16	0	6,6,6	0.12	0
2	SO4	A	1101	-	4,4,4	0.17	0	6,6,6	0.16	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.

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

### 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	315/380 (82%)	0.32	22 (6%) 16 13	38, 59, 96, 113	0
1	B	318/380 (83%)	0.18	14 (4%) 34 32	35, 53, 89, 111	0
1	C	299/380 (78%)	0.24	9 (3%) 50 46	40, 60, 86, 106	0
All	All	932/1140 (81%)	0.25	45 (4%) 30 28	35, 57, 89, 113	0

All (45) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	819	GLY	7.8
1	A	818	ALA	6.5
1	A	894	SER	6.2
1	A	893	THR	5.3
1	B	893	THR	5.1
1	A	700	PRO	5.0
1	A	898	ARG	4.7
1	C	698	SER	4.4
1	C	1011	LEU	4.4
1	B	698	SER	4.2
1	C	699	ASP	4.2
1	B	974	TRP	4.2
1	C	980	GLY	4.0
1	A	896	SER	3.9
1	B	676	ALA	3.7
1	B	894	SER	3.6
1	B	675	SER	3.5
1	A	897	GLY	3.5
1	A	1016	ASP	3.3
1	B	699	ASP	3.2
1	A	1014	LEU	3.1
1	A	895	ASN	3.1
1	C	821	ASP	3.0

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Mol	Chain	Res	Type	RSRZ
1	C	701	SER	3.0
1	A	701	SER	3.0
1	A	900	ALA	3.0
1	A	727	GLY	3.0
1	C	899	GLN	2.8
1	C	900	ALA	2.7
1	B	1014	LEU	2.7
1	A	703	TYR	2.6
1	A	882	CYS	2.6
1	B	1016	ASP	2.6
1	A	891	GLY	2.6
1	C	714	GLY	2.6
1	B	892	ARG	2.5
1	A	899	GLN	2.5
1	B	1015	ARG	2.4
1	A	682	LYS	2.4
1	B	953	TYR	2.3
1	A	902	ARG	2.3
1	A	933	HIS	2.3
1	B	700	PRO	2.1
1	B	1012	ASP	2.1
1	A	991	LEU	2.1

## 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. 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	B-factors( $\text{\AA}^2$ )	Q<0.9
2	SO4	A	1101	5/5	0.93	0.17	70,79,92,96	0

*Continued on next page...*

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	SO4	C	1101	5/5	0.95	0.11	68,69,72,74	0
2	SO4	B	1101	5/5	0.99	0.13	39,40,41,41	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.