



# wwPDB X-ray Structure Validation Summary Report ⓘ

Jul 26, 2017 – 02:05 PM EDT

PDB ID : 3B6W  
Title : Crystal Structure of the GLUR2 Ligand Binding Core (S1S2J) T686S Mutant  
in Complex with Glutamate at 1.7 Resolution  
Authors : Cho, Y.; Lolis, E.; Howe, J.R.  
Deposited on : unknown  
Resolution : 1.70 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 : 1.7.2 (RC1), CSD as538be (2017)  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20029824  
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)  
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) : rb-20029824

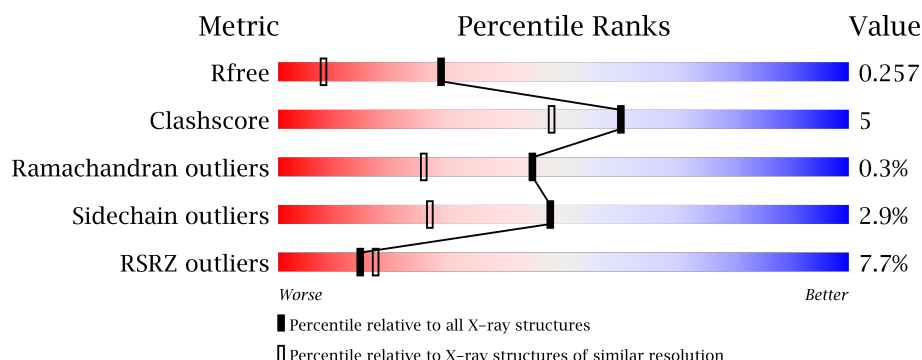
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 1.70 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))
$R_{free}$	100719	3453 (1.70-1.70)
Clashscore	112137	3876 (1.70-1.70)
Ramachandran outliers	110173	3815 (1.70-1.70)
Sidechain outliers	110143	3815 (1.70-1.70)
RSRZ outliers	101464	3491 (1.70-1.70)

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	263	
1	B	263	
1	C	263	
1	D	263	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit crite-

ria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	SO4	A	903	-	-	-	X
3	GLU	B	801	-	-	-	X

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 8407 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.

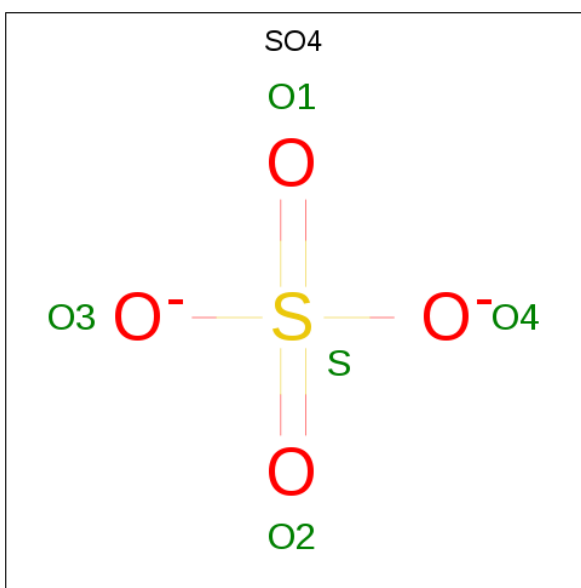
- Molecule 1 is a protein called Glutamate receptor 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	258	Total	C	N	O	S	0	1	0
			1988	1266	332	375	15			
1	B	258	Total	C	N	O	S	0	1	0
			1959	1249	326	369	15			
1	C	258	Total	C	N	O	S	0	1	0
			1967	1256	321	375	15			
1	D	258	Total	C	N	O	S	0	0	0
			1872	1188	310	361	13			

There are 20 discrepancies between the modelled and reference sequences:

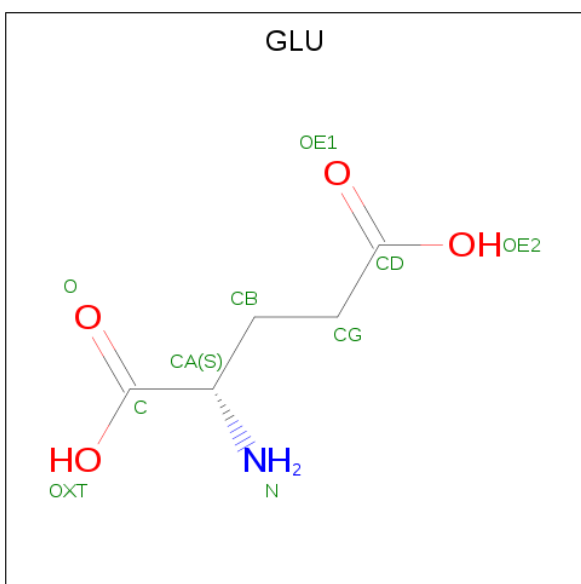
Chain	Residue	Modelled	Actual	Comment	Reference
A	390	GLY	-	EXPRESSION TAG	UNP P19491
A	391	ALA	-	EXPRESSION TAG	UNP P19491
A	630	GLY	-	LINKER	UNP P19491
A	631	THR	-	LINKER	UNP P19491
A	686	SER	THR	ENGINEERED	UNP P19491
B	390	GLY	-	EXPRESSION TAG	UNP P19491
B	391	ALA	-	EXPRESSION TAG	UNP P19491
B	630	GLY	-	LINKER	UNP P19491
B	631	THR	-	LINKER	UNP P19491
B	686	SER	THR	ENGINEERED	UNP P19491
C	390	GLY	-	EXPRESSION TAG	UNP P19491
C	391	ALA	-	EXPRESSION TAG	UNP P19491
C	630	GLY	-	LINKER	UNP P19491
C	631	THR	-	LINKER	UNP P19491
C	686	SER	THR	ENGINEERED	UNP P19491
D	390	GLY	-	EXPRESSION TAG	UNP P19491
D	391	ALA	-	EXPRESSION TAG	UNP P19491
D	630	GLY	-	LINKER	UNP P19491
D	631	THR	-	LINKER	UNP P19491
D	686	SER	THR	ENGINEERED	UNP P19491

- 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	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 GLUTAMIC ACID (three-letter code: GLU) (formula: C<sub>5</sub>H<sub>9</sub>NO<sub>4</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			10	5	1	4		
3	B	1	Total	C	N	O	0	0
			10	5	1	4		

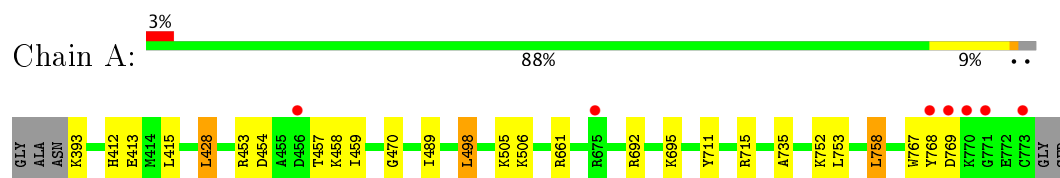
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	189	Total	O	0	0
			189	189		
4	B	117	Total	O	0	0
			117	117		
4	C	171	Total	O	0	0
			171	171		
4	D	104	Total	O	0	0
			104	104		

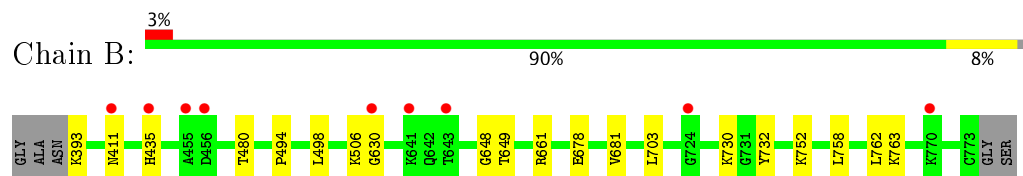
### 3 Residue-property plots [i](#)

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.

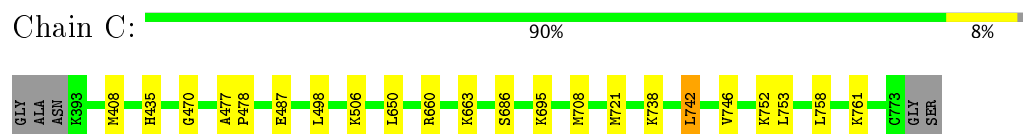
#### • Molecule 1: Glutamate receptor 2



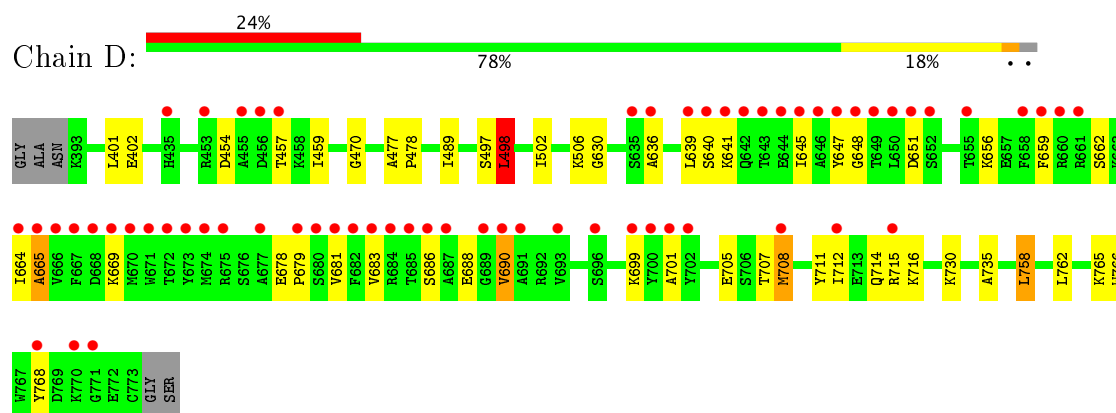
#### • Molecule 1: Glutamate receptor 2



#### • Molecule 1: Glutamate receptor 2



#### • Molecule 1: Glutamate receptor 2



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	47.82Å 95.84Å 122.89Å 90.00° 93.43° 90.00°	Depositor
Resolution (Å)	123.00 – 1.70 51.66 – 1.70	Depositor EDS
% Data completeness (in resolution range)	98.3 (123.00-1.70) 98.3 (51.66-1.70)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.06	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.71 (at 1.70Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, $R_{free}$	0.225 , 0.260 0.223 , 0.257	Depositor DCC
$R_{free}$ test set	6005 reflections (5.30%)	DCC
Wilson B-factor (Å <sup>2</sup> )	20.5	Xtriage
Anisotropy	0.085	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 46.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	8407	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	21.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 21.52 % of the origin peak, indicating pseudo translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo translational symmetry is equal to 6.8883e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<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 ⓘ

### 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	A	0.79	1/2027 (0.0%)	0.75	1/2728 (0.0%)
1	B	0.61	0/1998	0.68	0/2693
1	C	0.77	1/2008 (0.0%)	0.72	1/2710 (0.0%)
1	D	0.59	0/1903	0.69	1/2577 (0.0%)
All	All	0.70	2/7936 (0.0%)	0.71	3/10708 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	506	LYS	C-N	9.26	1.49	1.33
1	A	506	LYS	C-N	8.19	1.47	1.33

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	498	LEU	CA-CB-CG	5.44	127.82	115.30
1	C	650	LEU	CA-CB-CG	5.24	127.35	115.30
1	A	428	LEU	CB-CG-CD2	5.10	119.67	111.00

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	1988	0	2007	20	0
1	B	1959	0	1944	9	0
1	C	1967	0	1949	12	0
1	D	1872	0	1747	42	0
2	A	10	0	0	0	0
2	B	5	0	0	0	0
2	C	5	0	0	0	0
3	A	10	0	5	0	0
3	B	10	0	5	1	0
4	A	189	0	0	5	0
4	B	117	0	0	1	0
4	C	171	0	0	4	0
4	D	104	0	0	12	0
All	All	8407	0	7657	82	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 5.

The worst 5 of 82 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:D:647:TYR:HB3	1:D:701:ALA:O	1.43	1.15
1:D:645:ILE:HA	1:D:699:LYS:O	1.51	1.11
1:D:659:PHE:HB2	4:D:868:HOH:O	1.61	1.00
1:D:506:LYS:C	1:D:630:GLY:N	2.17	0.97
1:D:683:VAL:HB	4:D:863:HOH:O	1.70	0.89

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	257/263 (98%)	254 (99%)	2 (1%)	1 (0%)	38	20
1	B	255/263 (97%)	249 (98%)	6 (2%)	0	100	100
1	C	257/263 (98%)	255 (99%)	2 (1%)	0	100	100
1	D	254/263 (97%)	249 (98%)	3 (1%)	2 (1%)	22	7
All	All	1023/1052 (97%)	1007 (98%)	13 (1%)	3 (0%)	44	25

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	768	TYR
1	D	665	ALA
1	D	641	LYS

### 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	211/219 (96%)	207 (98%)	4 (2%)	62	45
1	B	203/219 (93%)	196 (97%)	7 (3%)	42	20
1	C	206/219 (94%)	201 (98%)	5 (2%)	54	35
1	D	177/219 (81%)	170 (96%)	7 (4%)	36	15
All	All	797/876 (91%)	774 (97%)	23 (3%)	48	26

5 of 23 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	763	LYS
1	C	498	LEU
1	D	730	LYS
1	C	408	MET
1	C	663	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	764	ASN
1	B	726	ASN
1	C	756	GLN
1	D	411	ASN
1	D	714	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](#)

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](#)

6 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	GLU	A	801	-	1,9,9	0.06	0	1,11,11	0.25	0
2	SO4	A	901	-	4,4,4	0.16	0	6,6,6	0.20	0
2	SO4	A	903	-	4,4,4	0.18	0	6,6,6	0.51	0
3	GLU	B	801	-	1,9,9	0.22	0	1,11,11	0.52	0
2	SO4	B	904	-	4,4,4	0.22	0	6,6,6	0.33	0
2	SO4	C	902	-	4,4,4	0.19	0	6,6,6	0.43	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	GLU	A	801	-	-	0/3/9/9	0/0/0/0
2	SO4	A	901	-	-	0/0/0/0	0/0/0/0
2	SO4	A	903	-	-	0/0/0/0	0/0/0/0
3	GLU	B	801	-	-	0/3/9/9	0/0/0/0
2	SO4	B	904	-	-	0/0/0/0	0/0/0/0
2	SO4	C	902	-	-	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.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	801	GLU	1	0

## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	B	1
1	D	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	B	506:LYS	C	630:GLY	N	2.31
1	D	506:LYS	C	630:GLY	N	2.17

## 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	258/263 (98%)	0.27	7 (2%) 55 60	9, 16, 29, 40	0
1	B	258/263 (98%)	0.38	9 (3%) 44 50	12, 21, 34, 39	0
1	C	258/263 (98%)	0.19	0 100 100	10, 17, 28, 35	0
1	D	258/263 (98%)	1.34	63 (24%) 1 1	15, 26, 49, 52	0
All	All	1032/1052 (98%)	0.54	79 (7%) 14 17	9, 20, 39, 52	0

The worst 5 of 79 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	646	ALA	8.1
1	D	671	TRP	7.4
1	D	670	MET	7.2
1	D	700	TYR	7.2
1	D	679	PRO	6.8

### 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	RSCC	RSR	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
2	SO4	A	903	5/5	0.96	0.13	2.53	28,32,33,35	0
3	GLU	B	801	10/10	0.91	0.12	2.29	12,13,15,16	0
3	GLU	A	801	10/10	0.94	0.11	0.68	8,10,12,13	0
2	SO4	C	902	5/5	0.96	0.12	0.08	36,37,39,40	0
2	SO4	B	904	5/5	0.96	0.09	-0.72	25,28,31,31	0
2	SO4	A	901	5/5	0.94	0.13	-	40,41,41,41	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.