



# wwPDB X-ray Structure Validation Summary Report ⓘ

Oct 5, 2024 – 02:40 PM EDT

PDB ID : 1EWK  
Title : CRYSTAL STRUCTURE OF METABOTROPIC GLUTAMATE RECEPTOR SUBTYPE 1 COMPLEXED WITH GLUTAMATE  
Authors : Kunishima, N.; Shimada, Y.; Jingami, H.; Morikawa, K.  
Deposited on : 2000-04-26  
Resolution : 2.20 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

<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 : 2022.3.0, CSD as543be (2022)  
Xtriage (Phenix) : 1.20.1  
EDS : 3.0  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
CCP4 : 9.0.003 (Gargrove)  
Density-Fitness : 1.0.11  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.39

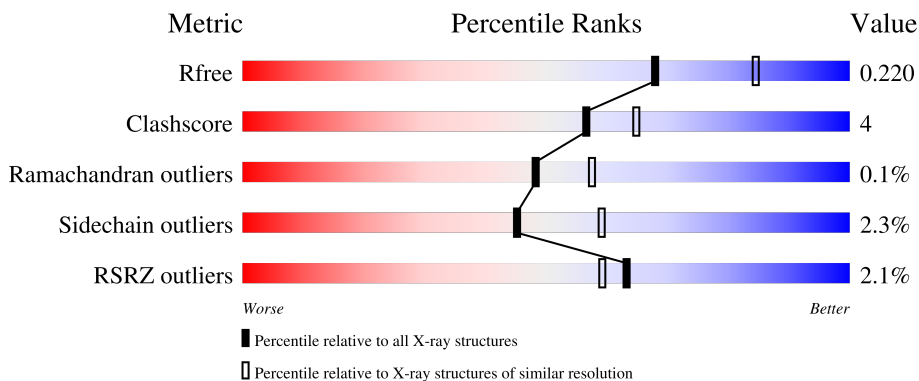
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.20 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))
$R_{free}$	164625	5791 (2.20-2.20)
Clashscore	180529	6634 (2.20-2.20)
Ramachandran outliers	177936	6560 (2.20-2.20)
Sidechain outliers	177891	6561 (2.20-2.20)
RSRZ outliers	164620	5791 (2.20-2.20)

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  $\geq 3$ , 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	490	 3% 79% 12% 9%
1	B	490	 % 82% 9% 8%

## 2 Entry composition [i](#)

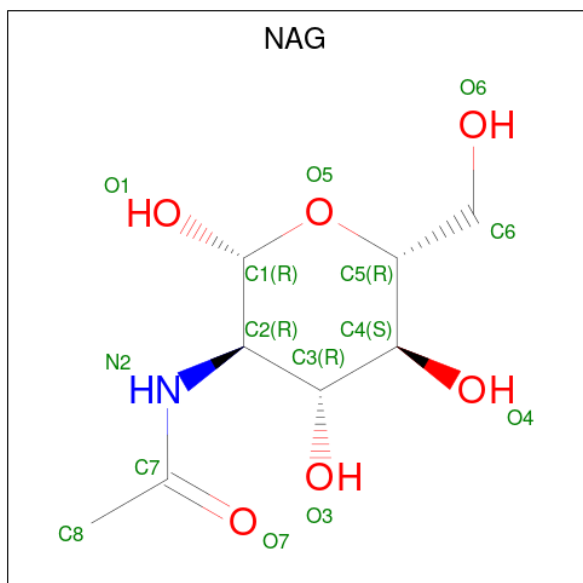
There are 6 unique types of molecules in this entry. The entry contains 7906 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 METABOTROPIC GLUTAMATE RECEPTOR SUBTYPE 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	448	Total 3566	C 2261	N 621	O 663	S 21	0	1	0
1	B	449	Total 3575	C 2266	N 623	O 665	S 21	0	1	0

- Molecule 2 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: C<sub>8</sub>H<sub>15</sub>NO<sub>6</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	A	1	Total 14	C 8	N 1	O 5	0	0
2	A	1	Total 14	C 8	N 1	O 5	0	0
2	B	1	Total 14	C 8	N 1	O 5	0	0

*Continued on next page...*

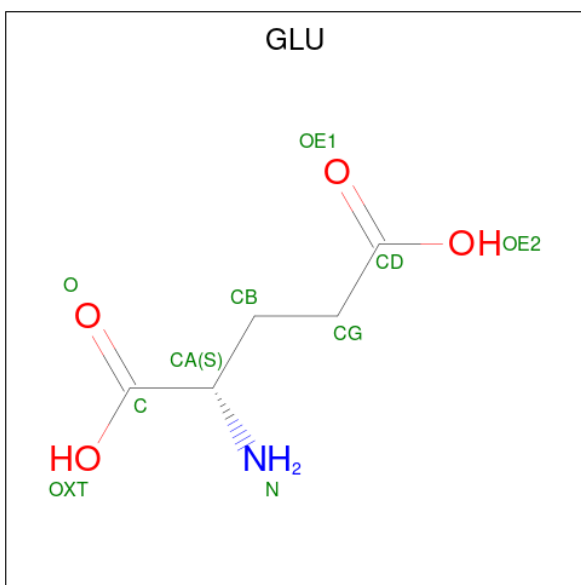
Continued from previous page...

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	B	1	14	8	1	5	0	0

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

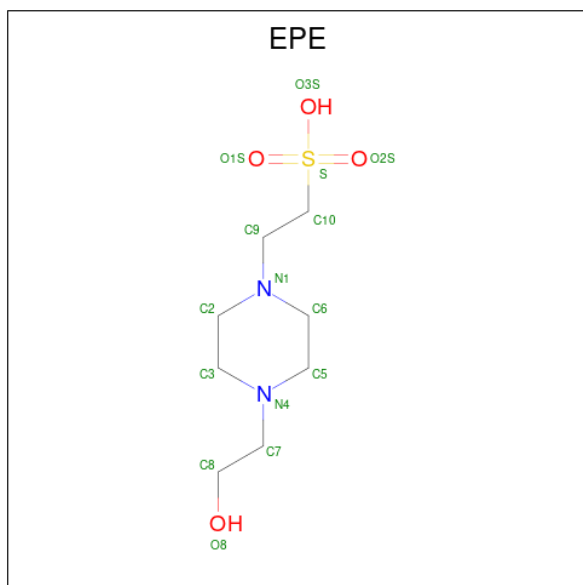
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
3	A	1	1	1	0	0
3	B	1	1	1	0	0

- Molecule 4 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
			Total	C	N	O		
4	A	1	10	5	1	4	0	0
4	B	1	10	5	1	4	0	0

- Molecule 5 is 4-(2-HYDROXYETHYL)-1-PIPERAZINE ETHANESULFONIC ACID (three-letter code: EPE) (formula: C<sub>8</sub>H<sub>18</sub>N<sub>2</sub>O<sub>4</sub>S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
5	A	1	Total 15	8	2	4	1	0	0
5	B	1	Total 15	8	2	4	1	0	0
5	B	1	Total 15	8	2	4	1	0	0

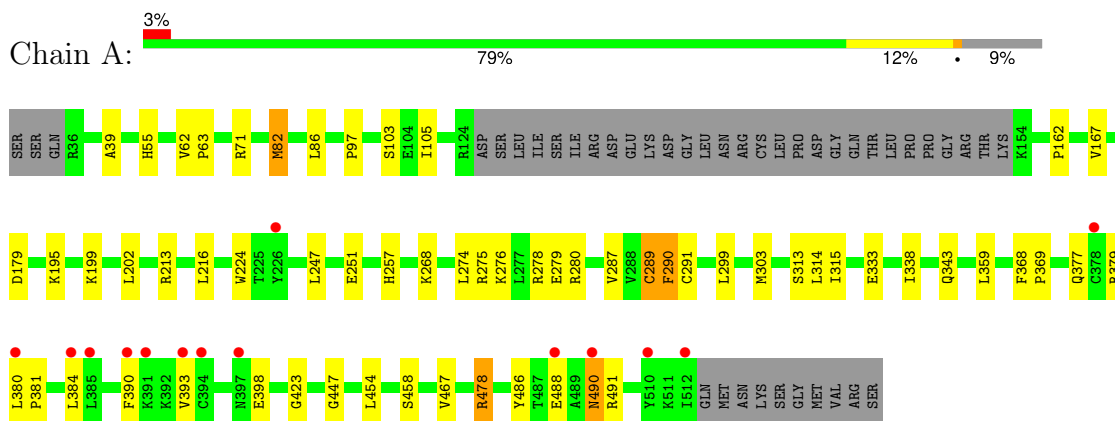
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	246	Total 246	O 246	0	0
6	B	396	Total 396	O 396	0	0

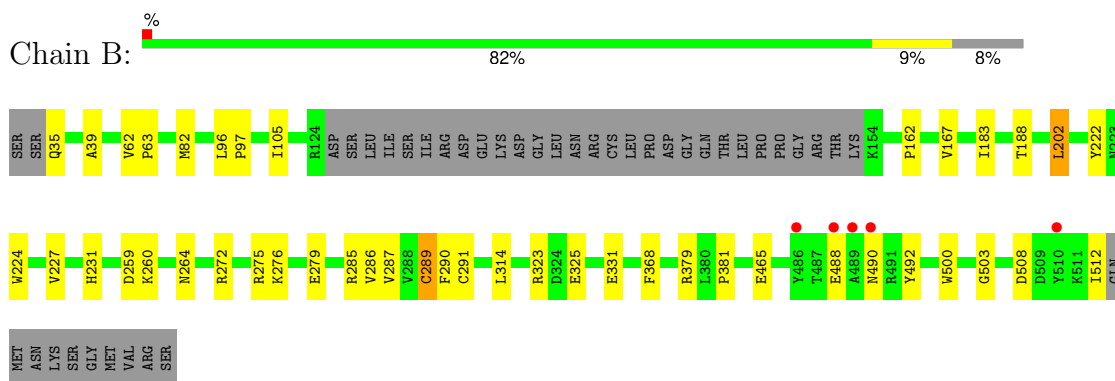
### 3 Residue-property plots [i](#)

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: METABOTROPIC GLUTAMATE RECEPTOR SUBTYPE 1



- Molecule 1: METABOTROPIC GLUTAMATE RECEPTOR SUBTYPE 1



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	83.38Å 95.22Å 97.45Å 90.00° 114.85° 90.00°	Depositor
Resolution (Å)	17.00 – 2.20 17.00 – 2.20	Depositor EDS
% Data completeness (in resolution range)	98.9 (17.00-2.20) 98.3 (17.00-2.20)	Depositor EDS
$R_{merge}$	0.04	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	9.02 (at 2.21Å)	Xtrriage
Refinement program	CNS	Depositor
R, $R_{free}$	0.196 , 0.227 0.189 , 0.220	Depositor DCC
$R_{free}$ test set	3497 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	25.6	Xtrriage
Anisotropy	0.305	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.38 , 52.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.017 for h,-k,-h-l	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	7906	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	37.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.34% 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: NAG, MG, EPE

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	0.32	0/3646	0.57	1/4931 (0.0%)
1	B	0.35	0/3655	0.60	1/4943 (0.0%)
All	All	0.34	0/7301	0.58	2/9874 (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	B	290	PHE	N-CA-C	-5.65	95.74	111.00
1	A	290	PHE	N-CA-C	-5.63	95.81	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	3566	0	3487	42	0
1	B	3575	0	3495	22	0
2	A	28	0	26	0	0
2	B	28	0	26	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	10	0	5	0	0

*Continued on next page...*



Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	10	0	5	1	0
5	A	15	0	18	0	0
5	B	30	0	36	2	0
6	A	246	0	0	1	0
6	B	396	0	0	0	0
All	All	7906	0	7098	64	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 4.

The worst 5 of 64 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:213:ARG:NH2	1:A:216:LEU:HD23	1.93	0.83
1:B:39:ALA:HB3	1:B:105:ILE:HB	1.69	0.73
1:A:257:HIS:HB2	1:A:280:ARG:HG3	1.69	0.73
1:A:39:ALA:HB3	1:A:105:ILE:HB	1.77	0.66
1:A:289[B]:CYS:HB3	1:A:291:CYS:SG	2.38	0.63

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	445/490 (91%)	423 (95%)	21 (5%)	1 (0%)	44	52
1	B	446/490 (91%)	431 (97%)	15 (3%)	0	100	100
All	All	891/980 (91%)	854 (96%)	36 (4%)	1 (0%)	48	57

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	97	PRO

### 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	385/422 (91%)	376 (98%)	9 (2%)	45 59
1	B	386/422 (92%)	375 (97%)	11 (3%)	38 51
All	All	771/844 (91%)	751 (97%)	20 (3%)	45 54

5 of 20 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	289[B]	CYS
1	B	488	GLU
1	B	508	ASP
1	B	490	ASN
1	A	478	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 13 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	35	GLN
1	B	170	GLN
1	B	490	ASN
1	B	250	GLN
1	B	343	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 oligosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 11 ligands modelled in this entry, 2 are monoatomic - leaving 9 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
5	EPE	A	901	-	15,15,15	1.84	3 (20%)	19,20,20	0.96	0
5	EPE	B	902	-	15,15,15	1.63	3 (20%)	19,20,20	0.98	1 (5%)
4	GLU	B	702	-	8,9,9	1.05	0	8,11,11	0.71	0
2	NAG	B	804	1	14,14,15	0.53	0	17,19,21	0.65	0
4	GLU	A	701	-	8,9,9	1.08	1 (12%)	8,11,11	0.84	0
2	NAG	A	802	1	14,14,15	0.53	0	17,19,21	0.68	1 (5%)
2	NAG	A	801	1	14,14,15	0.60	0	17,19,21	0.72	1 (5%)
2	NAG	B	803	1	14,14,15	0.57	0	17,19,21	0.73	1 (5%)
5	EPE	B	903	-	15,15,15	1.74	3 (20%)	19,20,20	0.96	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
5	EPE	A	901	-	-	2/9/19/19	0/1/1/1
5	EPE	B	902	-	-	2/9/19/19	0/1/1/1
4	GLU	B	702	-	-	3/9/9/9	-
2	NAG	B	804	1	-	0/6/23/26	0/1/1/1

*Continued on next page...*

Continued from previous page...

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	GLU	A	701	-	-	2/9/9/9	-
2	NAG	A	802	1	-	0/6/23/26	0/1/1/1
2	NAG	A	801	1	-	2/6/23/26	0/1/1/1
2	NAG	B	803	1	-	0/6/23/26	0/1/1/1
5	EPE	B	903	-	-	3/9/19/19	0/1/1/1

The worst 5 of 10 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	901	EPE	O1S-S	4.51	1.57	1.45
5	A	901	EPE	O2S-S	4.44	1.57	1.45
5	B	903	EPE	O2S-S	4.32	1.57	1.45
5	B	903	EPE	O1S-S	4.25	1.57	1.45
5	B	902	EPE	O1S-S	4.13	1.56	1.45

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	803	NAG	C2-N2-C7	-2.22	119.92	122.90
2	A	801	NAG	C2-N2-C7	-2.16	120.01	122.90
2	A	802	NAG	C2-N2-C7	-2.10	120.08	122.90
5	B	902	EPE	O2S-S-C10	2.00	109.75	106.73

There are no chirality outliers.

5 of 14 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	801	NAG	O5-C5-C6-O6
2	A	801	NAG	C4-C5-C6-O6
5	B	903	EPE	C9-C10-S-O3S
5	A	901	EPE	C10-C9-N1-C2
5	B	903	EPE	C9-C10-S-O1S

There are no ring outliers.

3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	B	902	EPE	1	0
4	B	702	GLU	1	0
5	B	903	EPE	1	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 [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

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	448/490 (91%)	-0.07	14 (3%) 51 48	14, 37, 69, 88	1 (0%)
1	B	449/490 (91%)	-0.35	5 (1%) 77 75	13, 30, 51, 67	1 (0%)
All	All	897/980 (91%)	-0.21	19 (2%) 63 59	13, 33, 59, 88	2 (0%)

The worst 5 of 19 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	489	ALA	3.4
1	A	512	ILE	3.4
1	A	226	TYR	3.3
1	A	385	LEU	3.0
1	A	394	CYS	2.9

### 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 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, 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	NAG	A	801	14/15	0.47	0.18	64,66,67,67	0
2	NAG	B	804	14/15	0.59	0.14	61,63,64,64	0
2	NAG	A	802	14/15	0.66	0.13	59,61,62,62	0
5	EPE	A	901	15/15	0.78	0.18	72,73,74,74	0
2	NAG	B	803	14/15	0.80	0.11	44,46,47,48	0
5	EPE	B	903	15/15	0.88	0.14	61,67,69,69	0
5	EPE	B	902	15/15	0.92	0.14	34,48,56,58	0
4	GLU	B	702	10/10	0.94	0.07	25,27,32,34	0
3	MG	B	1002	1/1	0.96	0.09	32,32,32,32	0
4	GLU	A	701	10/10	0.96	0.06	21,23,25,26	0
3	MG	A	1001	1/1	0.97	0.07	42,42,42,42	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.