



# Full wwPDB X-ray Structure Validation Report ⓘ

Dec 10, 2023 – 06:02 pm GMT

PDB ID : 1QME  
Title : PENICILLIN-BINDING PROTEIN 2X (PBP-2X)  
Authors : Gordon, E.J.; Mouz, N.; Duee, E.; Dideberg, O.  
Deposited on : 1999-09-28  
Resolution : 2.40 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.

The types of validation reports are described at

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

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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 : 1.8.4, CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
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) : 2.36

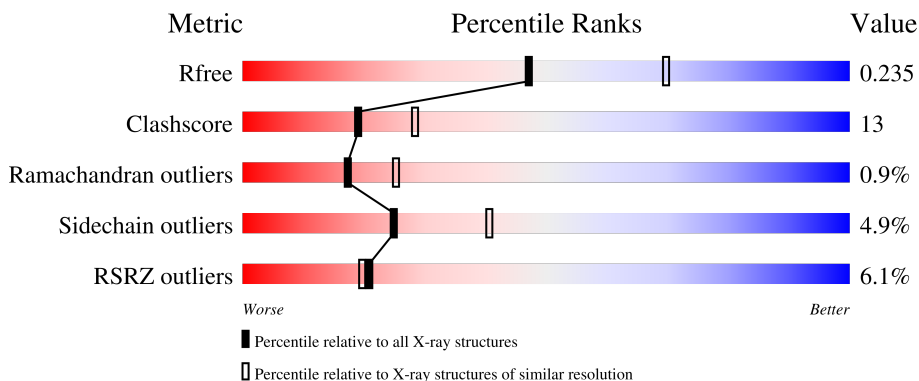
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.40 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	3907 (2.40-2.40)
Clashscore	141614	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)
RSRZ outliers	127900	3811 (2.40-2.40)

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	702	

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 criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	SO4	A	1003	-	-	-	X

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 4631 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 PENICILLIN-BINDING PROTEIN 2X.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	558	4256	2662	712	862	20	0	0	0

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



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

- Molecule 3 is water.

<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
3	A	360	Total 360	O 360	0	0



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	129.91Å 129.91Å 141.41Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 2.40 19.96 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.7 (50.00-2.40) 99.7 (19.96-2.50)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	0.06	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	8.07 (at 2.50Å)	Xtrriage
Refinement program	CNS 0.3	Depositor
R, $R_{free}$	0.197 , 0.235 0.198 , 0.235	Depositor DCC
$R_{free}$ test set	4261 reflections (10.09%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	34.9	Xtrriage
Anisotropy	0.200	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 48.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	4631	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	38.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.20% 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	0.33	0/4330	0.62	0/5867

There are no bond length outliers.

There are no bond angle outliers.

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	4256	0	4177	110	0
2	A	15	0	0	0	0
3	A	360	0	0	11	0
All	All	4631	0	4177	110	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 13.

All (110) 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:203:LEU:HD11	1:A:211:LYS:HB3	1.37	1.02

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:75:LYS:HE3	1:A:257:ASP:HB3	1.42	0.98
1:A:557:LYS:HA	1:A:557:LYS:HE2	1.46	0.94
1:A:565:LEU:H	1:A:565:LEU:HD12	1.32	0.92
1:A:290:THR:HB	1:A:588:THR:OG1	1.78	0.82
1:A:290:THR:HG21	1:A:458:GLN:HE22	1.49	0.75
1:A:372:ARG:HD2	1:A:377:ASN:HD21	1.51	0.74
1:A:711:ALA:HA	1:A:716:ILE:CD1	2.20	0.71
1:A:348:ILE:HD13	1:A:510:LEU:HB3	1.71	0.70
1:A:711:ALA:HA	1:A:716:ILE:HD11	1.74	0.69
1:A:424:PRO:HG3	1:A:434:ALA:HB2	1.74	0.69
1:A:731:ASP:OD1	1:A:732:VAL:HG23	1.96	0.66
1:A:290:THR:HG21	1:A:458:GLN:NE2	2.11	0.64
1:A:201:ALA:HB2	1:A:220:GLU:CG	2.27	0.64
1:A:286:GLY:HA2	1:A:592:PRO:HA	1.80	0.63
1:A:598:ILE:O	1:A:602:GLU:HG3	1.99	0.62
1:A:75:LYS:O	1:A:75:LYS:HD2	1.98	0.62
1:A:689:LEU:HD22	1:A:690:SER:O	1.99	0.62
1:A:76:ARG:HH21	1:A:220:GLU:HG3	1.63	0.62
1:A:596:SER:HB3	1:A:599:GLN:OE1	1.99	0.61
1:A:392:PHE:HA	1:A:400:MET:HE3	1.83	0.61
1:A:716:ILE:H	1:A:716:ILE:HD13	1.64	0.61
1:A:351:ASN:HB2	3:A:2135:HOH:O	2.01	0.60
1:A:443:VAL:O	1:A:447:GLN:HG3	2.01	0.60
1:A:340:LYS:HG2	1:A:400:MET:HG3	1.84	0.60
1:A:227:LEU:O	1:A:258:GLY:HA3	2.01	0.59
1:A:737:ALA:O	1:A:741:ILE:HD13	2.02	0.59
1:A:309:THR:HG21	3:A:2065:HOH:O	2.01	0.59
1:A:566:THR:O	1:A:591:GLN:HA	2.02	0.59
1:A:363:GLU:HG3	3:A:2147:HOH:O	2.02	0.59
1:A:306:GLN:O	1:A:309:THR:HG23	2.02	0.59
1:A:203:LEU:HD21	1:A:211:LYS:HD3	1.86	0.58
1:A:564:GLY:O	1:A:567:ASP:HB2	2.02	0.58
1:A:73:PRO:HA	1:A:231:ASP:OD2	2.04	0.57
1:A:202:GLN:HE21	1:A:216:THR:HG21	1.68	0.57
1:A:75:LYS:HD2	1:A:75:LYS:C	2.26	0.57
1:A:565:LEU:H	1:A:565:LEU:CD1	2.10	0.56
1:A:647:GLY:O	1:A:651:GLU:HG3	2.05	0.56
1:A:280:PHE:O	1:A:284:VAL:HG22	2.08	0.54
1:A:76:ARG:NH2	1:A:220:GLU:HG3	2.23	0.54
1:A:201:ALA:HB2	1:A:220:GLU:HG2	1.89	0.54
1:A:687:LEU:HG	1:A:706:THR:HG23	1.89	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:372:ARG:HD2	1:A:377:ASN:ND2	2.22	0.53
1:A:309:THR:HG22	3:A:2027:HOH:O	2.07	0.53
1:A:566:THR:HB	1:A:592:PRO:O	2.09	0.53
1:A:649:LEU:HD22	1:A:653:LEU:HG	1.92	0.52
1:A:728:GLN:HG3	1:A:749:GLY:HA3	1.90	0.52
1:A:632:GLN:HA	3:A:2168:HOH:O	2.10	0.51
1:A:545:ALA:HB3	1:A:575:MET:HB2	1.93	0.51
1:A:457:THR:OG1	1:A:460:GLN:HG3	2.11	0.51
1:A:325:ARG:O	1:A:325:ARG:HD3	2.10	0.50
1:A:512:ARG:HD2	1:A:578:ALA:O	2.12	0.50
1:A:675:GLU:CD	1:A:675:GLU:H	2.15	0.50
1:A:704:LYS:O	1:A:708:GLU:HG3	2.12	0.49
1:A:77:GLY:HA3	1:A:259:LYS:O	2.11	0.49
1:A:528:TYR:OH	1:A:533:GLY:HA2	2.11	0.49
1:A:289:MET:HB2	1:A:307:ARG:HB2	1.94	0.49
1:A:632:GLN:HG2	1:A:633:GLN:N	2.28	0.49
1:A:702:TRP:HH2	1:A:710:LEU:HD22	1.78	0.49
1:A:492:ARG:HG3	1:A:634:SER:HB2	1.95	0.49
1:A:542:GLN:NE2	1:A:577:PRO:HG3	2.28	0.49
1:A:350:ASN:ND2	1:A:352:THR:OG1	2.46	0.48
1:A:670:LYS:HD3	1:A:670:LYS:O	2.14	0.48
1:A:563:VAL:HG22	1:A:564:GLY:N	2.29	0.48
1:A:290:THR:HG21	1:A:458:GLN:OE1	2.13	0.48
1:A:372:ARG:HB2	1:A:377:ASN:HD21	1.78	0.47
1:A:422:GLY:HA3	1:A:437:LEU:HD22	1.97	0.47
1:A:714:LEU:HB2	1:A:716:ILE:CD1	2.45	0.47
1:A:702:TRP:CH2	1:A:710:LEU:HD22	2.50	0.46
1:A:298:THR:OG1	1:A:300:GLU:HG3	2.16	0.46
1:A:336:GLY:HA3	1:A:551:ALA:HB2	1.97	0.46
1:A:512:ARG:NH2	3:A:2234:HOH:O	2.40	0.46
1:A:675:GLU:CD	1:A:675:GLU:N	2.69	0.46
1:A:731:ASP:OD2	1:A:745:THR:HB	2.15	0.46
1:A:309:THR:HB	1:A:310:PHE:H	1.52	0.46
1:A:649:LEU:HD13	1:A:688:ILE:CD1	2.46	0.46
1:A:75:LYS:HG3	1:A:257:ASP:CG	2.37	0.45
1:A:364:LEU:HB3	1:A:371:ILE:HB	1.98	0.45
1:A:352:THR:HB	3:A:2166:HOH:O	2.16	0.45
1:A:672:SER:HA	1:A:687:LEU:O	2.17	0.45
1:A:75:LYS:CE	1:A:257:ASP:HB3	2.31	0.45
1:A:407:MET:HG2	1:A:411:THR:HB	1.98	0.45
1:A:306:GLN:NE2	3:A:2094:HOH:O	2.51	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:467:ALA:HB2	1:A:474:MET:HG2	2.00	0.44
1:A:267:SER:N	1:A:268:PRO:HD2	2.33	0.43
1:A:714:LEU:HB2	1:A:716:ILE:HD12	2.01	0.43
1:A:495:GLN:NE2	3:A:2224:HOH:O	2.51	0.43
1:A:569:ILE:HG12	1:A:590:GLN:HG3	2.00	0.43
1:A:734:ALA:O	1:A:735:ASN:HB2	2.18	0.43
1:A:314:THR:O	1:A:315:LYS:HB2	2.18	0.43
1:A:219:MET:HE2	1:A:223:LEU:HD22	2.01	0.42
1:A:400:MET:HE2	3:A:2162:HOH:O	2.18	0.42
1:A:685:GLN:OE1	1:A:703:THR:HG23	2.19	0.42
1:A:195:SER:HB3	1:A:310:PHE:CZ	2.54	0.42
1:A:201:ALA:N	1:A:220:GLU:HG2	2.34	0.42
1:A:264:THR:HB	1:A:300:GLU:HB3	2.02	0.41
1:A:532:THR:CG2	1:A:534:LYS:HB2	2.50	0.41
1:A:510:LEU:HD22	1:A:514:ASN:ND2	2.35	0.41
1:A:207:GLU:C	1:A:209:GLY:H	2.22	0.41
1:A:320:GLU:HG2	3:A:2110:HOH:O	2.21	0.41
1:A:659:GLN:O	1:A:685:GLN:HA	2.20	0.41
1:A:491:ALA:O	1:A:633:GLN:HA	2.20	0.41
1:A:330:GLN:HA	1:A:433:TYR:CD1	2.55	0.41
1:A:290:THR:HG21	1:A:458:GLN:CD	2.41	0.41
1:A:563:VAL:HG22	1:A:564:GLY:H	1.85	0.41
1:A:200:LEU:C	1:A:220:GLU:HG2	2.41	0.41
1:A:364:LEU:HD21	1:A:402:LEU:HD21	2.03	0.41
1:A:334:GLU:HG2	1:A:454:ILE:O	2.21	0.40
1:A:413:LEU:HD23	1:A:413:LEU:HA	1.96	0.40
1:A:547:LYS:HA	1:A:547:LYS:HD2	1.85	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	550/702 (78%)	521 (95%)	24 (4%)	5 (1%)	17 25

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	367	ALA
1	A	558	ASN
1	A	559	GLY
1	A	208	ASP
1	A	739	LYS

### 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	467/590 (79%)	444 (95%)	23 (5%)	25 40

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	75	LYS
1	A	81	ASP
1	A	213	LEU
1	A	269	LEU
1	A	293	LEU
1	A	309	THR
1	A	325	ARG
1	A	364	LEU
1	A	368	ASP
1	A	427	PHE
1	A	510	LEU
1	A	520	THR
1	A	565	LEU
1	A	567	ASP
1	A	580	ASN
1	A	649	LEU

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Mol	Chain	Res	Type
1	A	680	LEU
1	A	689	LEU
1	A	712	LYS
1	A	715	ASN
1	A	716	ILE
1	A	733	ARG
1	A	740	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	185	ASN
1	A	202	GLN
1	A	350	ASN
1	A	377	ASN
1	A	501	ASN
1	A	514	ASN
1	A	580	ASN

### 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 monosaccharides 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	A	1003	-	4,4,4	0.30	0	6,6,6	0.07	0
2	SO4	A	1001	-	4,4,4	0.27	0	6,6,6	0.19	0
2	SO4	A	1002	-	4,4,4	0.28	0	6,6,6	0.05	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	558/702 (79%)	-0.23	34 (6%) <span style="border: 1px solid red; padding: 2px;">21</span> <span style="border: 1px solid red; padding: 2px;">20</span>	21, 33, 64, 90	0

All (34) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	254	ARG	5.6
1	A	557	LYS	4.6
1	A	207	GLU	4.5
1	A	558	ASN	4.5
1	A	620	LEU	4.0
1	A	183	SER	3.7
1	A	92	THR	3.7
1	A	72	VAL	3.5
1	A	71	THR	3.3
1	A	368	ASP	3.3
1	A	750	ASP	3.2
1	A	559	GLY	3.1
1	A	740	ASP	3.0
1	A	565	LEU	3.0
1	A	563	VAL	2.8
1	A	367	ALA	2.8
1	A	555	ASP	2.7
1	A	377	ASN	2.6
1	A	531	SER	2.6
1	A	632	GLN	2.6
1	A	380	LEU	2.6
1	A	739	LYS	2.5
1	A	564	GLY	2.5
1	A	379	GLY	2.4
1	A	208	ASP	2.4
1	A	556	GLU	2.4
1	A	742	LYS	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	381	THR	2.1
1	A	530	HIS	2.1
1	A	619	ASN	2.1
1	A	211	LYS	2.1
1	A	232	GLY	2.1
1	A	382	GLY	2.1
1	A	566	THR	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 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(Å <sup>2</sup> )	Q<0.9
2	SO4	A	1003	5/5	0.74	0.46	94,96,99,99	0
2	SO4	A	1002	5/5	0.89	0.22	95,95,97,97	0
2	SO4	A	1001	5/5	0.90	0.20	59,63,65,68	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.