



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 20, 2026 – 08:26 AM UTC

PDB ID : 7RT9 / pdb\_00007rt9  
Title : Crystal structures of human PYY and NPY  
Authors : Langley, D.B.; Christ, D.  
Deposited on : 2021-08-12  
Resolution : 1.90 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 : 4-5-2 with Phenix2.0  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtrriage (Phenix) : 2.0  
EDS : 3.0  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
CCP4 : 9.0.010 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.49

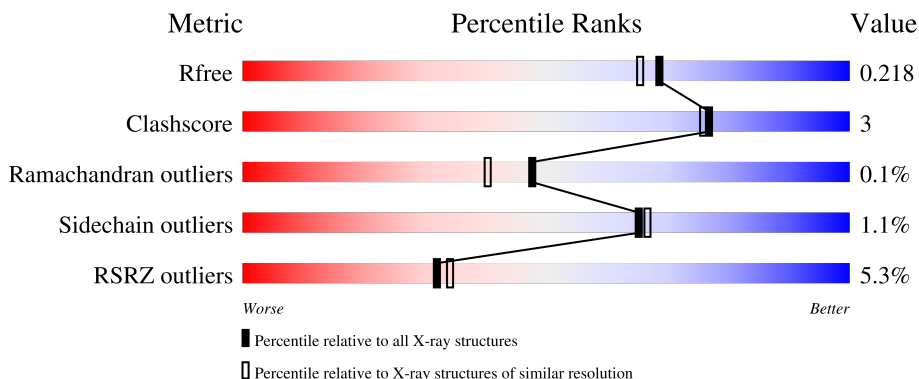
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.90 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.



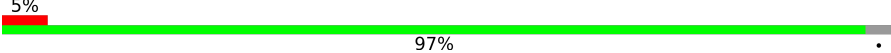
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	180053	7789 (1.90-1.90)
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)
RSRZ outliers	180081	7790 (1.90-1.90)

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	223	<div style="display: flex; align-items: center;"> <div style="width: 12%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 83%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 8%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 9%; height: 10px; background-color: grey;"></div> </div>
1	C	223	<div style="display: flex; align-items: center;"> <div style="width: 0%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 86%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 7%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 7%; height: 10px; background-color: grey;"></div> </div>
2	B	214	<div style="display: flex; align-items: center;"> <div style="width: 6%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 93%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 6%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 0%; height: 10px; background-color: grey;"></div> </div>
2	D	214	<div style="display: flex; align-items: center;"> <div style="width: 2%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 92%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 7%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 0%; height: 10px; background-color: grey;"></div> </div>
3	Y	37	<div style="display: flex; align-items: center;"> <div style="width: 5%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 100%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 0%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 0%; height: 10px; background-color: grey;"></div> </div>

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Mol	Chain	Length	Quality of chain
3	Z	37	 A horizontal bar chart representing the quality of chain. The bar is divided into three segments: a small red segment on the left labeled '5%', a large green segment in the middle labeled '97%', and a very small grey segment on the right. A small black dot is located at the far right end of the bar.

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 7416 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 4A3B2-A Fab heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	204	1498	950	252	290	6	0	0	0
1	C	207	1540	976	259	299	6	0	0	0

- Molecule 2 is a protein called 4A3B2-A Fab light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	212	1593	1005	267	315	6	0	0	0
2	D	213	1628	1025	274	323	6	0	0	0

- Molecule 3 is a protein called Peptide YY.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	Y	37	299	189	55	55	0	0	1
3	Z	36	280	177	54	49	0	0	1

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
Y	9	GLY	ARG	variant	UNP P10082
Y	37	NH2	-	amidation	UNP P10082
Z	9	GLY	ARG	variant	UNP P10082
Z	37	NH2	-	amidation	UNP P10082

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 6 3 3	0	0
4	Y	1	Total C O 6 3 3	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	125	Total O 125 125	0	0
5	B	109	Total O 109 109	0	0
5	C	168	Total O 168 168	0	0
5	D	107	Total O 107 107	0	0
5	Y	32	Total O 32 32	0	0
5	Z	25	Total O 25 25	0	0





- Molecule 3: Peptide YY

Chain Z: 5% 97%



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	76.98Å 103.30Å 138.35Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	42.11 – 1.90 42.11 – 1.90	Depositor EDS
% Data completeness (in resolution range)	99.5 (42.11-1.90) 99.5 (42.11-1.90)	Depositor EDS
$R_{merge}$	0.12	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.23 (at 1.89Å)	Xtrriage
Refinement program	REFMAC 5.8.0258	Depositor
R, $R_{free}$	0.179 , 0.212 0.188 , 0.218	Depositor DCC
$R_{free}$ test set	4393 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	19.1	Xtrriage
Anisotropy	0.507	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 37.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	7416	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	23.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.77% 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: NH2, GOL

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	1.12	0/1538	1.25	1/2106 (0.0%)
1	C	1.07	0/1580	1.18	1/2161 (0.0%)
2	B	1.12	0/1633	1.27	2/2228 (0.1%)
2	D	1.06	0/1668	1.21	1/2270 (0.0%)
3	Y	1.05	0/307	1.32	0/418
3	Z	1.13	0/287	1.31	0/390
All	All	1.09	0/7013	1.24	5/9573 (0.1%)

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	61	ASN	CB-CA-C	5.68	118.76	109.90
2	D	29	ILE	N-CA-C	-5.48	107.39	112.43
2	B	168	SER	CA-C-N	5.43	127.82	120.65
2	B	168	SER	C-N-CA	5.43	127.82	120.65
1	A	106	THR	CA-CB-OG1	-5.11	101.94	109.60

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	1498	0	1394	12	0
1	C	1540	0	1466	12	0
2	B	1593	0	1476	7	0
2	D	1628	0	1538	8	0
3	Y	299	0	281	0	0
3	Z	280	0	264	0	0
4	A	6	0	8	0	0
4	Y	6	0	8	0	0
5	A	125	0	0	0	0
5	B	109	0	0	0	0
5	C	168	0	0	2	0
5	D	107	0	0	1	0
5	Y	32	0	0	0	0
5	Z	25	0	0	0	0
All	All	7416	0	6435	38	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 3.

All (38) 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:C:13:GLN:NE2	5:C:301:HOH:O	2.19	0.76
1:C:18:LEU:HD23	1:C:19:ARG:N	2.03	0.73
2:D:105:GLU:HG2	2:D:106:ILE:N	2.08	0.68
1:C:122:PRO:HD3	1:C:208:LYS:HE2	1.81	0.62
2:B:12:SER:OG	2:B:105:GLU:OE1	2.17	0.59
1:C:2:VAL:HG11	1:C:101:TYR:CG	2.38	0.58
2:D:31:ASN:O	2:D:50:ASN:HA	2.04	0.57
1:C:8:GLY:O	1:C:18:LEU:HD21	2.05	0.56
2:B:4:MET:HE3	2:B:23:CYS:SG	2.46	0.55
1:A:194:ILE:HD11	1:A:207:ASP:CB	2.37	0.55
1:A:177:LEU:C	1:A:177:LEU:HD12	2.33	0.53
1:A:142:LYS:NZ	1:A:170:GLN:OE1	2.43	0.52
2:D:46:PHE:CZ	2:D:49:TYR:HB3	2.45	0.52
1:C:18:LEU:HD23	1:C:18:LEU:C	2.36	0.51
1:A:183:VAL:HG11	1:A:193:TYR:CE1	2.45	0.51
2:D:91:PHE:HA	2:D:96:PHE:CD1	2.46	0.50
1:A:183:VAL:HG11	1:A:193:TYR:CZ	2.48	0.49
2:B:31:ASN:O	2:B:50:ASN:HA	2.13	0.48
1:A:153:TRP:CH2	1:A:195:CYS:HB3	2.49	0.48
1:A:154:ASN:O	1:A:156:GLY:N	2.48	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:167:ALA:HA	1:A:177:LEU:HB3	1.98	0.46
1:C:142:LYS:HE2	5:D:304:HOH:O	2.16	0.45
2:B:46:PHE:CZ	2:B:49:TYR:HB3	2.51	0.45
2:D:183:LYS:O	2:D:187:GLU:HG2	2.18	0.44
1:C:13:GLN:CD	5:C:301:HOH:O	2.57	0.44
1:C:122:PRO:HD3	1:C:208:LYS:CE	2.47	0.43
2:B:175:LEU:C	2:B:175:LEU:HD23	2.44	0.42
1:A:154:ASN:HA	1:A:194:ILE:HG23	2.01	0.42
2:B:159:SER:HA	2:B:178:THR:O	2.20	0.42
2:D:110:VAL:HG21	2:D:199:GLN:HE21	1.85	0.42
1:C:177:LEU:HD12	1:C:177:LEU:C	2.45	0.41
1:C:100:ALA:HA	2:D:46:PHE:CD2	2.56	0.41
2:D:11:LEU:C	2:D:11:LEU:HD12	2.46	0.41
1:A:138:GLY:HA2	1:A:153:TRP:CH2	2.57	0.40
1:A:2:VAL:HG11	1:A:101:TYR:CD1	2.56	0.40
1:A:2:VAL:HG11	1:A:101:TYR:CE1	2.55	0.40
2:B:166:GLN:HG2	2:B:171:SER:HA	2.03	0.40
1:C:67:ARG:NH2	1:C:90:ASP:OD2	2.48	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	200/223 (90%)	193 (96%)	6 (3%)	1 (0%)	24	16
1	C	203/223 (91%)	200 (98%)	3 (2%)	0	100	100
2	B	210/214 (98%)	201 (96%)	9 (4%)	0	100	100
2	D	211/214 (99%)	207 (98%)	4 (2%)	0	100	100
3	Y	35/37 (95%)	35 (100%)	0	0	100	100
3	Z	34/37 (92%)	34 (100%)	0	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	893/948 (94%)	870 (97%)	22 (2%)	1 (0%)	48	40

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	155	SER

### 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	157/189 (83%)	154 (98%)	3 (2%)	50	47
1	C	167/189 (88%)	166 (99%)	1 (1%)	78	81
2	B	169/187 (90%)	168 (99%)	1 (1%)	78	81
2	D	178/187 (95%)	175 (98%)	3 (2%)	53	52
3	Y	30/32 (94%)	30 (100%)	0	100	100
3	Z	27/32 (84%)	27 (100%)	0	100	100
All	All	728/816 (89%)	720 (99%)	8 (1%)	65	67

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	50	ASN
1	A	72	ARG
1	A	194	ILE
2	B	105	GLU
1	C	72	ARG
2	D	33	LEU
2	D	104	LEU
2	D	105	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	59	ASN
2	B	152	ASN
2	D	199	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](#)

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	$\# Z  > 2$
4	GOL	Y	101	-	5,5,5	0.13	0	5,5,5	0.34	0
4	GOL	A	301	-	5,5,5	0.21	0	5,5,5	0.37	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
4	GOL	Y	101	-	-	0/4/4/4	-
4	GOL	A	301	-	-	3/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	301	GOL	O1-C1-C2-C3
4	A	301	GOL	O1-C1-C2-O2
4	A	301	GOL	O2-C2-C3-O3

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	204/223 (91%)	0.41	26 (12%) <b>8</b> <b>8</b>	10, 23, 49, 60	0
1	C	207/223 (92%)	-0.24	2 (0%) <b>79</b> <b>82</b>	12, 18, 32, 48	0
2	B	212/214 (99%)	0.26	12 (5%) <b>29</b> <b>31</b>	11, 24, 45, 59	0
2	D	213/214 (99%)	-0.01	4 (1%) <b>66</b> <b>70</b>	13, 22, 37, 52	0
3	Y	36/37 (97%)	0.01	2 (5%) <b>30</b> <b>32</b>	13, 21, 35, 40	0
3	Z	35/37 (94%)	0.11	2 (5%) <b>29</b> <b>31</b>	15, 24, 41, 46	0
All	All	907/948 (95%)	0.10	48 (5%) <b>32</b> <b>34</b>	10, 21, 43, 60	0

All (48) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	158	LEU	5.2
1	A	159	THR	5.1
1	A	155	SER	5.0
2	B	168	SER	4.8
1	A	210	VAL	3.9
1	A	157	ALA	3.7
3	Z	2	PRO	3.7
1	A	192	THR	3.7
1	A	208	LYS	3.6
1	A	194	ILE	3.5
1	A	206	VAL	3.5
3	Z	3	ILE	3.4
1	A	161	GLY	3.3
1	A	153	TRP	3.2
1	C	126	SER	3.1
2	D	202	SER	3.1
2	B	212	GLY	3.1
2	B	110	VAL	2.9
2	B	203	SER	2.9

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Mol	Chain	Res	Type	RSRZ
1	A	160	SER	2.9
1	A	2	VAL	2.8
1	A	125	PRO	2.7
1	A	133	GLY	2.7
1	A	203	ASN	2.6
1	A	193	TYR	2.6
2	B	194	CYS	2.5
2	B	144	ALA	2.5
1	A	209	LYS	2.4
1	A	197	VAL	2.4
1	A	207	ASP	2.3
2	B	202	SER	2.3
2	D	203	SER	2.3
2	B	125	LEU	2.3
2	B	169	LYS	2.3
1	C	66	SER	2.2
2	B	127	SER	2.2
3	Y	1	TYR	2.2
1	A	152	SER	2.1
1	A	154	ASN	2.1
2	B	185	ASP	2.1
1	A	182	THR	2.1
1	A	156	GLY	2.1
2	D	205	VAL	2.1
2	D	153	ALA	2.1
1	A	211	GLU	2.0
3	Y	3	ILE	2.0
1	A	191	GLN	2.0
2	B	205	VAL	2.0

## 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 oligosaccharides 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
4	GOL	A	301	6/6	0.76	0.18	42,48,48,52	0
4	GOL	Y	101	6/6	0.95	0.09	17,23,29,31	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.