



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 16, 2023 – 03:44 PM EDT

PDB ID : 2A2N  
Title : Crystal Structure of the peptidylprolyl isomerase domain of Human PPWD1  
Authors : Walker, J.R.; Davis, T.L.; Newman, E.M.; Mackenzie, F.; Sundstrom, M.; Arrowsmith, C.; Edwards, A.; Bochkarev, A.; Dhe-Paganon, S.; Structural Genomics Consortium (SGC)  
Deposited on : 2005-06-22  
Resolution : 1.65 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 : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.35  
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) : 2.35

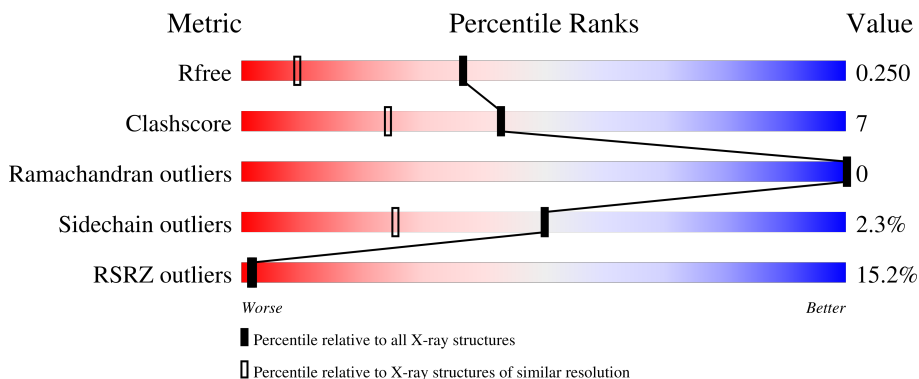
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.65 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	1827 (1.66-1.66)
Clashscore	141614	1931 (1.66-1.66)
Ramachandran outliers	138981	1891 (1.66-1.66)
Sidechain outliers	138945	1891 (1.66-1.66)
RSRZ outliers	127900	1791 (1.66-1.66)

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	176	 6% 81% 12% 7%
1	B	176	 34% 76% 16% 7%
1	C	176	 3% 86% 7% 6%

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4259 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 peptidylprolyl isomerase domain and WD repeat containing 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	164	1286	809	227	243	7	0	0	0
1	B	164	1286	809	227	243	7	0	0	0
1	C	165	1293	813	228	245	7	0	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	471	GLY	-	cloning artifact	UNP Q96BP3
A	472	SER	-	cloning artifact	UNP Q96BP3
B	471	GLY	-	cloning artifact	UNP Q96BP3
B	472	SER	-	cloning artifact	UNP Q96BP3
C	471	GLY	-	cloning artifact	UNP Q96BP3
C	472	SER	-	cloning artifact	UNP Q96BP3

- Molecule 2 is GLYCEROL (three-letter code: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	C	1	Total C O 6 3 3	0	0

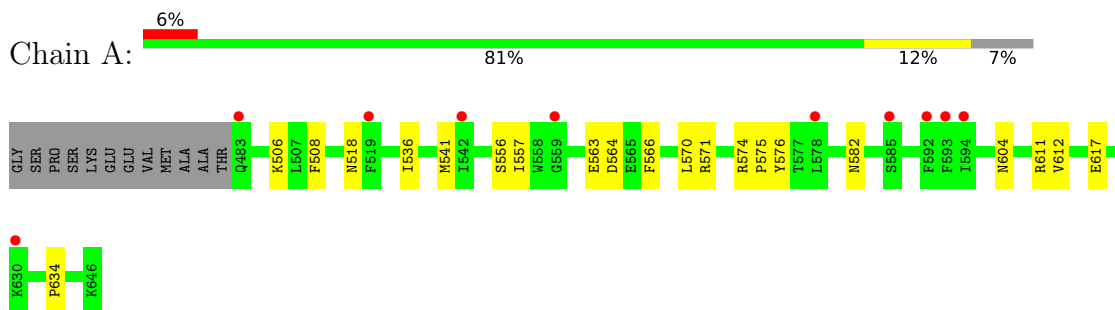
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	156	Total O 156 156	0	0
3	B	65	Total O 65 65	0	0
3	C	167	Total O 167 167	0	0

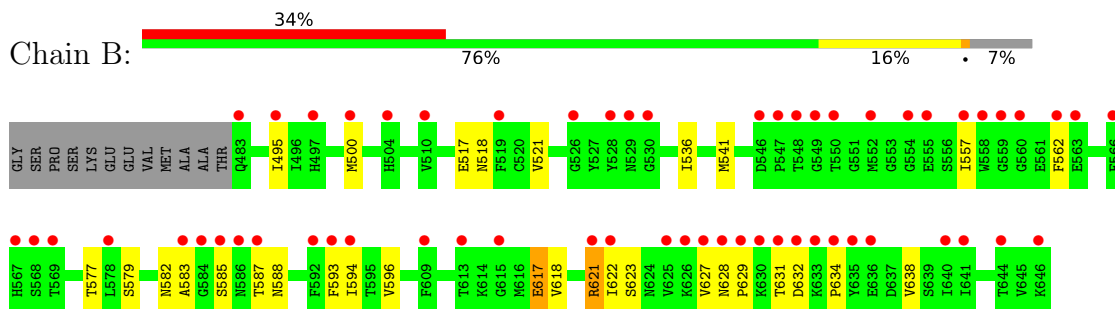
### 3 Residue-property plots [i](#)

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.

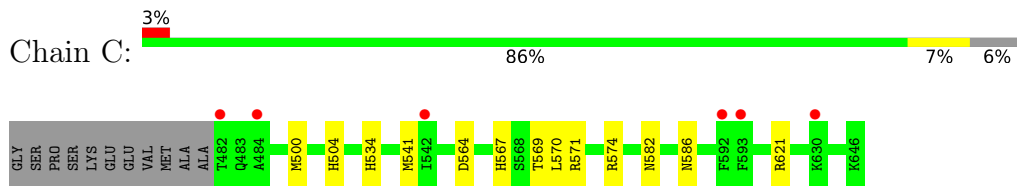
- Molecule 1: peptidylprolyl isomerase domain and WD repeat containing 1



- Molecule 1: peptidylprolyl isomerase domain and WD repeat containing 1



- Molecule 1: peptidylprolyl isomerase domain and WD repeat containing 1



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	139.66Å 39.89Å 115.64Å 90.00° 122.33° 90.00°	Depositor
Resolution (Å)	23.20 – 1.65 23.20 – 1.65	Depositor EDS
% Data completeness (in resolution range)	91.4 (23.20-1.65) 91.4 (23.20-1.65)	Depositor EDS
$R_{merge}$	0.04	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.76 (at 1.65Å)	Xtrriage
Refinement program	REFMAC 5.2.0005	Depositor
R, $R_{free}$	0.199 , 0.245 0.206 , 0.250	Depositor DCC
$R_{free}$ test set	3027 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	29.2	Xtrriage
Anisotropy	0.426	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 53.5	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	0.96	EDS
Total number of atoms	4259	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	46.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.37% 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

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: 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	0.76	0/1319	0.70	0/1787
1	B	0.54	0/1319	0.62	0/1787
1	C	0.81	0/1326	0.72	0/1797
All	All	0.72	0/3964	0.68	0/5371

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

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	1286	0	1246	15	0
1	B	1286	0	1246	26	0
1	C	1293	0	1253	11	0
2	C	6	0	8	0	0
3	A	156	0	0	2	0
3	B	65	0	0	1	0
3	C	167	0	0	3	0
All	All	4259	0	3753	52	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 7.

All (52) 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:B:495:ILE:HG23	3:B:265:HOH:O	1.68	0.91
1:C:500:MET:CE	1:C:621:ARG:HG2	2.00	0.91
1:A:574:ARG:HD2	1:A:611:ARG:HD3	1.72	0.71
1:C:564:ASP:H	1:C:586:ASN:HD22	1.37	0.70
1:A:536:ILE:HD12	1:A:634:PRO:HG3	1.74	0.69
1:C:570:LEU:O	1:C:571:ARG:HD3	1.93	0.68
1:C:500:MET:HE3	1:C:621:ARG:HG2	1.77	0.67
1:B:500:MET:HE3	1:B:621:ARG:HH21	1.60	0.67
1:B:500:MET:SD	1:B:638:VAL:HG21	2.35	0.67
1:B:583:ALA:N	1:B:587:THR:OG1	2.26	0.65
1:A:563:GLU:HG2	1:A:564:ASP:O	1.97	0.65
1:A:518:ASN:ND2	1:A:557:ILE:H	1.95	0.65
1:A:574:ARG:HD2	1:A:611:ARG:CD	2.26	0.64
1:B:631:THR:O	1:B:632:ASP:HB2	2.00	0.61
1:C:574:ARG:NH1	3:C:327:HOH:O	2.34	0.61
1:B:596:VAL:HG11	1:B:623:SER:HB3	1.81	0.61
1:B:617:GLU:H	1:B:617:GLU:CD	2.03	0.60
3:A:30:HOH:O	1:C:534:HIS:HE1	1.89	0.55
1:B:521:VAL:HB	1:B:557:ILE:HG21	1.89	0.55
1:B:500:MET:HB3	1:B:621:ARG:HH22	1.73	0.54
1:B:500:MET:CE	1:B:621:ARG:NH2	2.72	0.53
1:A:566:PHE:HB3	1:A:604:ASN:ND2	2.25	0.52
1:A:518:ASN:HD22	1:A:557:ILE:H	1.57	0.52
1:A:518:ASN:HD21	1:A:556:SER:HA	1.76	0.51
1:B:518:ASN:ND2	1:B:557:ILE:H	2.09	0.51
1:C:534:HIS:HD2	3:C:17:HOH:O	1.95	0.50
1:B:500:MET:HE3	1:B:621:ARG:NH2	2.26	0.50
1:B:500:MET:HB3	1:B:621:ARG:NH2	2.28	0.49
1:B:517:GLU:O	1:B:521:VAL:HG23	2.13	0.49
1:C:567:HIS:HD2	1:C:569:THR:OG1	1.95	0.49
1:B:536:ILE:HD13	1:B:622:ILE:O	2.14	0.48
1:B:627:VAL:HA	1:B:634:PRO:HA	1.96	0.48
1:B:577:THR:O	1:B:594:ILE:HA	2.13	0.48
1:C:504:HIS:HD2	3:C:366:HOH:O	1.96	0.48
1:A:506:LYS:HE2	1:A:508:PHE:HE1	1.79	0.47
1:B:500:MET:SD	1:B:638:VAL:CG2	3.02	0.47
1:B:518:ASN:HD22	1:B:557:ILE:H	1.63	0.47
1:A:574:ARG:NH2	3:A:254:HOH:O	2.47	0.47
1:A:576:TYR:HB3	1:A:612:VAL:HB	1.97	0.47
1:B:579:SER:HB2	1:B:593:PHE:CZ	2.50	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:500:MET:CB	1:B:621:ARG:HH2	2.27	0.46
1:B:631:THR:O	1:B:632:ASP:CB	2.63	0.46
1:B:596:VAL:HG11	1:B:623:SER:CB	2.46	0.46
1:A:570:LEU:O	1:A:571:ARG:HD3	2.17	0.45
1:C:567:HIS:CD2	1:C:569:THR:OG1	2.70	0.45
1:B:618:VAL:O	1:B:622:ILE:HG13	2.17	0.45
1:A:571:ARG:HA	1:A:571:ARG:HD2	1.73	0.43
1:C:571:ARG:HD3	1:C:571:ARG:HA	1.71	0.43
1:B:562:PHE:O	1:B:588:ASN:HB2	2.18	0.43
1:A:574:ARG:HB2	1:A:575:PRO:HD2	2.00	0.42
1:A:574:ARG:CD	1:A:611:ARG:HD3	2.45	0.42
1:B:628:ASN:HA	1:B:629:PRO:HD3	1.83	0.41

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	162/176 (92%)	153 (94%)	9 (6%)	0	100	100
1	B	162/176 (92%)	150 (93%)	12 (7%)	0	100	100
1	C	163/176 (93%)	154 (94%)	9 (6%)	0	100	100
All	All	487/528 (92%)	457 (94%)	30 (6%)	0	100	100

There are no Ramachandran outliers to report.

### 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	144/153 (94%)	141 (98%)	3 (2%)	53	29
1	B	144/153 (94%)	139 (96%)	5 (4%)	36	11
1	C	145/153 (95%)	143 (99%)	2 (1%)	67	46
All	All	433/459 (94%)	423 (98%)	10 (2%)	50	25

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	541	MET
1	A	582	ASN
1	A	617	GLU
1	B	541	MET
1	B	582	ASN
1	B	585	SER
1	B	617	GLU
1	B	621	ARG
1	C	541	MET
1	C	582	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	518	ASN
1	A	624	ASN
1	B	518	ASN
1	B	624	ASN
1	C	534	HIS
1	C	567	HIS
1	C	586	ASN
1	C	620	GLN
1	C	624	ASN

### 5.3.3 RNA ⓘ

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](#)

1 ligand is 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	GOL	C	401	-	5,5,5	0.30	0	5,5,5	1.06	1 (20%)

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
2	GOL	C	401	-	-	2/4/4/4	-

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	401	GOL	C3-C2-C1	-2.31	102.74	111.70

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	401	GOL	O2-C2-C3-O3
2	C	401	GOL	C1-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	164/176 (93%)	0.30	10 (6%) 21 19	29, 37, 48, 61	0
1	B	164/176 (93%)	1.77	59 (35%) 0 0	37, 58, 79, 84	0
1	C	165/176 (93%)	0.08	6 (3%) 42 43	28, 36, 50, 68	0
All	All	493/528 (93%)	0.72	75 (15%) 2 1	28, 41, 71, 84	0

All (75) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	635	TYR	8.8
1	B	641	ILE	6.6
1	B	559	GLY	6.6
1	B	626	LYS	6.1
1	B	629	PRO	5.8
1	B	549	GLY	5.7
1	B	569	THR	5.1
1	B	584	GLY	5.1
1	B	563	GLU	4.5
1	B	552	MET	4.5
1	B	587	THR	4.4
1	B	646	LYS	4.3
1	B	550	THR	4.2
1	B	583	ALA	4.2
1	B	562	PHE	4.1
1	B	566	PHE	4.1
1	B	548	THR	4.0
1	B	567	HIS	4.0
1	B	640	ILE	3.8
1	B	500	MET	3.8
1	B	526	GLY	3.7
1	A	483	GLN	3.6
1	B	585	SER	3.6

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	A	542	ILE	3.6
1	B	547	PRO	3.5
1	B	558	TRP	3.5
1	B	631	THR	3.5
1	B	627	VAL	3.5
1	B	628	ASN	3.5
1	C	482	THR	3.4
1	A	593	PHE	3.4
1	A	594	ILE	3.3
1	B	636	GLU	3.1
1	B	546	ASP	3.1
1	A	585	SER	3.1
1	B	557	ILE	3.1
1	B	528	TYR	3.0
1	B	592	PHE	3.0
1	C	593	PHE	3.0
1	A	578	LEU	3.0
1	B	625	VAL	2.9
1	C	630	LYS	2.9
1	B	593	PHE	2.8
1	B	632	ASP	2.8
1	B	495	ILE	2.7
1	C	592	PHE	2.7
1	B	530	GLY	2.7
1	B	510	VAL	2.7
1	A	592	PHE	2.7
1	B	634	PRO	2.7
1	B	613	THR	2.6
1	C	542	ILE	2.6
1	B	568	SER	2.6
1	B	483	GLN	2.6
1	B	555	GLU	2.5
1	B	633	LYS	2.5
1	B	622	ILE	2.5
1	B	578	LEU	2.5
1	B	586	ASN	2.4
1	B	560	GLY	2.4
1	A	519	PHE	2.4
1	B	504	HIS	2.4
1	B	644	THR	2.4
1	B	554	GLY	2.3
1	B	497	HIS	2.3

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Mol	Chain	Res	Type	RSRZ
1	B	630	LYS	2.3
1	A	630	LYS	2.3
1	B	609	PHE	2.2
1	B	594	ILE	2.2
1	B	519	PHE	2.1
1	B	529	ASN	2.1
1	C	484	ALA	2.1
1	A	559	GLY	2.1
1	B	615	GLY	2.0
1	B	621	ARG	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 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	GOL	C	401	6/6	0.84	0.18	48,48,56,60	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.