



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 20, 2026 – 02:17 PM UTC

PDB ID : 3W6W / pdb_00003w6w
Title : Crystal structure of melB holo-protyrosinase from *Aspergillus oryzae*
Authors : Fujieda, N.; Yabuta, S.; Ikeda, T.; Oyama, T.; Muraki, N.; Kurisu, G.; Itoh, S.
Deposited on : 2013-02-22
Resolution : 1.39 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

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	:	4-5-2 with Phenix2.0
Xtriage (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

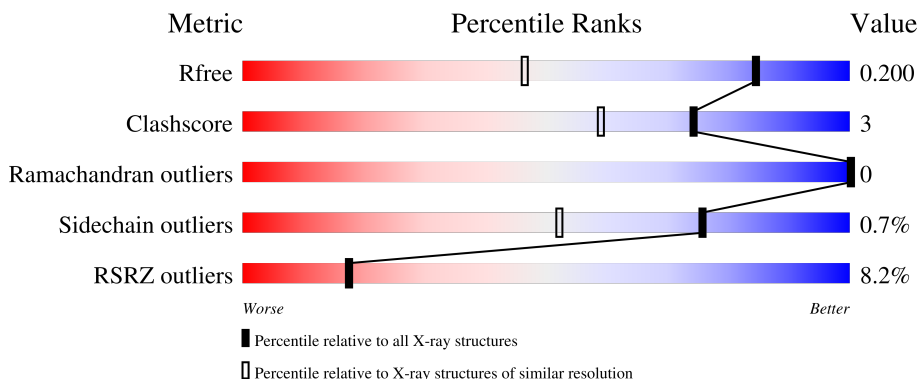
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.39 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	2563 (1.40-1.40)
Clashscore	190562	2660 (1.40-1.40)
Ramachandran outliers	187476	2611 (1.40-1.40)
Sidechain outliers	187428	2610 (1.40-1.40)
RSRZ outliers	180081	2561 (1.40-1.40)

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 ≥ 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	620	
1	B	620	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 11010 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 Tyrosinase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	583	Total	C	N	O	S	0	65	0
			5121	3305	876	923	17			
1	B	555	Total	C	N	O	S	0	43	0
			4790	3098	827	850	15			

- Molecule 2 is COPPER (II) ION (CCD ID: CU) (formula: Cu).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	2	Total	Cu	0	0
			2	2		
2	B	2	Total	Cu	0	0
			2	2		

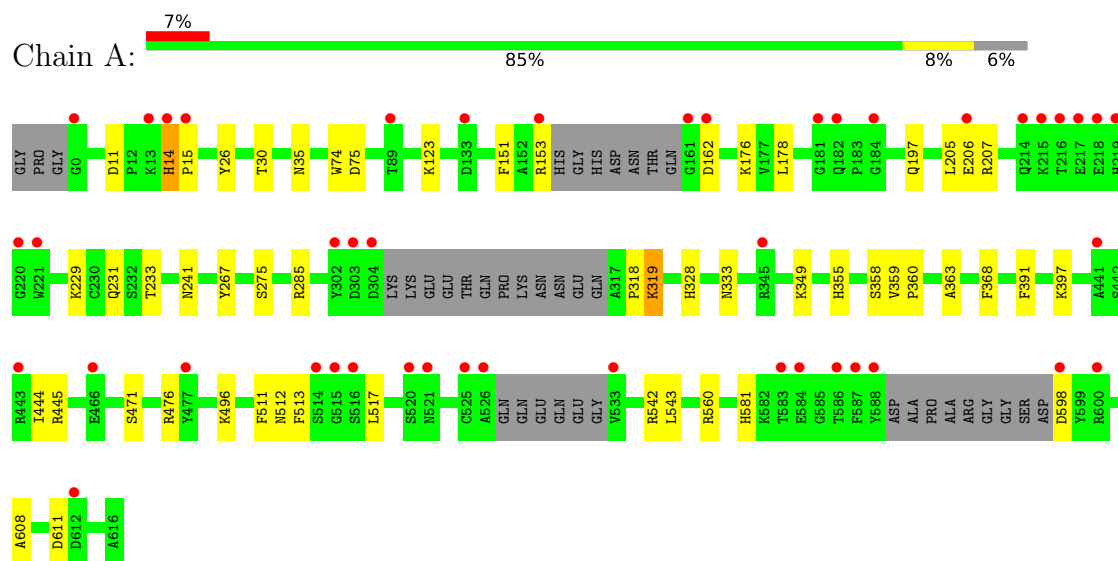
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	587	Total	O	0	0
			587	587		
3	B	508	Total	O	0	0
			508	508		

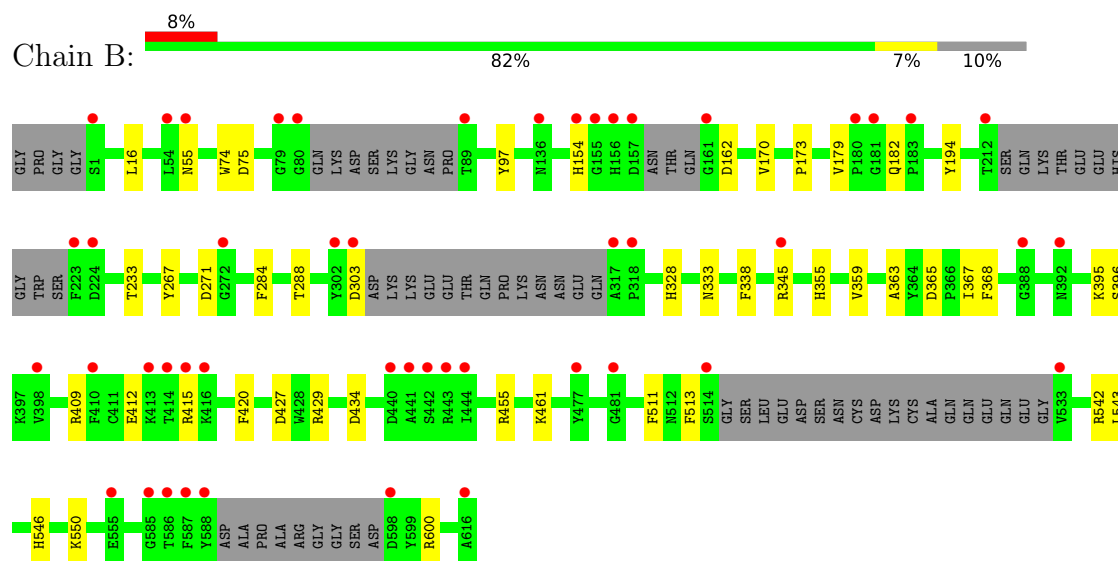
3 Residue-property plots [i](#)

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: Tyrosinase



• Molecule 1: Tyrosinase



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	52.31Å 118.09Å 84.21Å 90.00° 97.40° 90.00°	Depositor
Resolution (Å)	34.07 – 1.39 34.07 – 1.39	Depositor EDS
% Data completeness (in resolution range)	97.7 (34.07-1.39) 97.6 (34.07-1.39)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.07 (at 1.39Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8_1069)	Depositor
R, R_{free}	0.177 , 0.199 0.178 , 0.200	Depositor DCC
R_{free} test set	9914 reflections (4.93%)	wwPDB-VP
Wilson B-factor (Å ²)	14.0	Xtriage
Anisotropy	0.155	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 40.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	11010	wwPDB-VP
Average B, all atoms (Å ²)	19.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.22% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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: CU

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	0.41	0/5451	0.70	1/7392 (0.0%)
1	B	0.41	0/5052	0.70	0/6857
All	All	0.41	0/10503	0.70	1/14249 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	444	ILE	N-CA-C	5.19	115.92	110.62

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	5121	0	5093	38	0
1	B	4790	0	4724	26	0
2	A	2	0	0	0	0
2	B	2	0	0	0	0
3	A	587	0	0	9	0
3	B	508	0	0	1	0
All	All	11010	0	9817	61	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 (61) 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:205:LEU:O	1:A:207[B]:ARG:NH1	2.26	0.69
1:B:412:GLU:OE1	1:B:415[A]:ARG:NH2	2.27	0.67
1:A:123[B]:LYS:NZ	3:A:1376:HOH:O	2.29	0.66
1:B:16[B]:LEU:HG	1:B:434:ASP:HB2	1.78	0.65
1:A:241[B]:ASN:HD21	1:B:154:HIS:CE1	2.15	0.64
1:B:16[B]:LEU:HD21	1:B:429[B]:ARG:HG2	1.79	0.64
1:A:11[A]:ASP:HB3	1:A:14[A]:HIS:HD2	1.68	0.59
1:A:15:PRO:HA	3:A:1561:HOH:O	2.02	0.59
1:A:318:PRO:HB3	1:A:471:SER:HB3	1.84	0.59
1:A:476[B]:ARG:HH11	1:A:517:LEU:HA	1.68	0.58
1:A:11[A]:ASP:HB3	1:A:14[A]:HIS:CD2	2.40	0.56
1:B:303:ASP:HB3	1:B:395:LYS:HE3	1.88	0.55
1:B:546:HIS:CE1	1:B:550:LYS:HE2	2.41	0.55
1:B:170[A]:VAL:HG21	1:B:367[A]:ILE:HD13	1.90	0.53
1:A:391:PHE:O	1:A:397:LYS:HE3	2.11	0.51
1:A:319:LYS:H	1:A:319:LYS:NZ	2.09	0.50
1:A:151:PHE:CG	1:A:162:ASP:HB3	2.46	0.50
1:A:206:GLU:HG3	3:A:1269:HOH:O	2.12	0.49
1:A:319:LYS:H	1:A:319:LYS:HZ2	1.58	0.49
1:B:74:TRP:CE3	1:B:75:ASP:HB2	2.48	0.49
1:B:233:THR:HA	1:B:355:HIS:CE1	2.48	0.48
1:B:365:ASP:OD1	1:B:367[A]:ILE:HG22	2.12	0.48
1:A:349[A]:LYS:NZ	3:A:1270:HOH:O	2.47	0.47
1:A:598:ASP:OD1	1:A:598:ASP:N	2.48	0.46
1:A:318:PRO:HG2	1:A:581:HIS:CE1	2.50	0.46
1:B:365:ASP:CG	1:B:367[A]:ILE:HG22	2.41	0.46
1:A:233:THR:HA	1:A:355:HIS:CE1	2.51	0.46
1:B:267:TYR:OH	1:B:543:LEU:HB3	2.15	0.46
1:A:275:SER:OG	1:B:345:ARG:NH2	2.49	0.46
1:A:285:ARG:NH2	3:A:1399:HOH:O	2.49	0.46
1:B:179[A]:VAL:HG23	1:B:182:GLN:HB2	1.98	0.45
1:B:173:PRO:HG3	1:B:194:TYR:CZ	2.51	0.45
1:B:162:ASP:HB2	1:B:455[B]:ARG:NH2	2.32	0.45
1:B:363:ALA:HA	1:B:368:PHE:CG	2.53	0.44
1:A:363:ALA:HA	1:A:368:PHE:CG	2.52	0.44
1:B:600[B]:ARG:NH1	3:B:1271:HOH:O	2.51	0.44
1:A:476[A]:ARG:HG3	1:A:512:ASN:OD1	2.18	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:197:GLN:HG3	1:A:231:GLN:HG2	2.01	0.43
1:B:97:TYR:CD2	1:B:396:SER:HA	2.54	0.43
1:B:427:ASP:OD1	1:B:429[B]:ARG:NE	2.47	0.43
1:A:542:ARG:HD3	1:A:542:ARG:C	2.44	0.42
1:A:267:TYR:OH	1:A:543:LEU:HB3	2.19	0.42
1:A:359[A]:VAL:HG22	1:A:513:PHE:CE2	2.54	0.42
1:A:496:LYS:NZ	1:A:611:ASP:OD2	2.45	0.42
1:A:153[B]:ARG:NH2	3:A:1563:HOH:O	2.52	0.41
1:A:319:LYS:O	3:A:1577:HOH:O	2.21	0.41
1:A:560[B]:ARG:NH2	1:A:608:ALA:HA	2.36	0.41
1:A:35:ASN:O	1:A:178:LEU:HD11	2.20	0.41
1:A:496:LYS:HE3	1:B:271:ASP:OD1	2.20	0.41
1:B:284:PHE:CE1	1:B:288:THR:HG21	2.55	0.41
1:A:229:LYS:HE2	3:A:1351:HOH:O	2.19	0.41
1:B:333:ASN:HB2	1:B:511:PHE:CD2	2.56	0.41
1:A:445[B]:ARG:HD2	1:A:445[B]:ARG:HA	1.93	0.41
1:A:26:TYR:CZ	1:A:30:THR:HG21	2.56	0.41
1:A:358:SER:OG	1:A:360:PRO:HD2	2.20	0.41
1:A:74:TRP:CE3	1:A:75:ASP:HB2	2.55	0.41
1:A:176:LYS:HE2	3:A:1427:HOH:O	2.21	0.41
1:B:359[A]:VAL:HG22	1:B:513:PHE:CE2	2.56	0.41
1:A:333:ASN:HB2	1:A:511:PHE:CD2	2.56	0.40
1:B:542:ARG:C	1:B:542:ARG:HD3	2.46	0.40
1:B:409:ARG:HB3	1:B:420:PHE:CE1	2.55	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	637/620 (103%)	627 (98%)	10 (2%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	584/620 (94%)	575 (98%)	9 (2%)	0	100	100
All	All	1221/1240 (98%)	1202 (98%)	19 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	568/537 (106%)	564 (99%)	4 (1%)	76	52
1	B	520/537 (97%)	516 (99%)	4 (1%)	73	48
All	All	1088/1074 (101%)	1080 (99%)	8 (1%)	76	52

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

Mol	Chain	Res	Type
1	A	14[A]	HIS
1	A	14[B]	HIS
1	A	319	LYS
1	A	328	HIS
1	B	55	ASN
1	B	328	HIS
1	B	338	PHE
1	B	461	LYS

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	140	GLN
1	A	280	GLN
1	A	333	ASN
1	B	95	ASN
1	B	197	GLN

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Mol	Chain	Res	Type
1	B	333	ASN
1	B	371	HIS

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 4 ligands modelled in this entry, 4 are monoatomic - leaving 0 for Mogul analysis.

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, 95th 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 ²)	Q < 0.9
1	A	583/620 (94%)	0.38	45 (7%)	19 20	5, 15, 34, 54	65 (11%)
1	B	555/620 (89%)	0.41	48 (8%)	16 16	6, 16, 36, 51	43 (7%)
All	All	1138/1240 (91%)	0.40	93 (8%)	17 17	5, 15, 35, 54	108 (9%)

All (93) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	587	PHE	5.7
1	B	223	PHE	5.6
1	A	588	TYR	5.6
1	B	477	TYR	5.5
1	B	155	GLY	4.9
1	B	156	HIS	4.8
1	A	515	GLY	4.6
1	B	588	TYR	4.3
1	B	440	ASP	4.2
1	B	154	HIS	4.1
1	B	157	ASP	4.1
1	A	514	SER	4.0
1	B	443	ARG	4.0
1	B	414	THR	4.0
1	A	219	HIS	3.9
1	B	587	PHE	3.9
1	B	441	ALA	3.8
1	B	181	GLY	3.8
1	B	598	ASP	3.7
1	A	216	THR	3.5
1	B	89	THR	3.5
1	A	181	GLY	3.5
1	B	514	SER	3.4
1	B	183	PRO	3.4

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Mol	Chain	Res	Type	RSRZ
1	A	526	ALA	3.3
1	B	303	ASP	3.3
1	B	392	ASN	3.3
1	B	212	THR	3.3
1	A	218[A]	GLU	3.2
1	A	15	PRO	3.2
1	A	0	GLY	3.1
1	B	317	ALA	3.1
1	B	161	GLY	3.1
1	A	161	GLY	3.1
1	A	214	GLN	3.1
1	B	224	ASP	3.0
1	A	586	THR	3.0
1	A	525	CYS	3.0
1	B	80	GLY	3.0
1	B	442	SER	3.0
1	B	388	GLY	2.9
1	A	600	ARG	2.8
1	A	303[A]	ASP	2.8
1	A	14[A]	HIS	2.7
1	A	217	GLU	2.7
1	A	182	GLN	2.7
1	A	584	GLU	2.6
1	A	521	ASN	2.6
1	B	345	ARG	2.6
1	B	555	GLU	2.6
1	B	444	ILE	2.6
1	A	533	VAL	2.5
1	B	55	ASN	2.5
1	A	215	LYS	2.5
1	A	133	ASP	2.4
1	B	586	THR	2.4
1	B	481	GLY	2.4
1	B	585	GLY	2.4
1	A	153[A]	ARG	2.3
1	A	612	ASP	2.3
1	B	79	GLY	2.3
1	A	13[A]	LYS	2.3
1	B	533	VAL	2.3
1	A	221	TRP	2.3
1	A	441	ALA	2.3
1	B	302	TYR	2.3

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Mol	Chain	Res	Type	RSRZ
1	B	318	PRO	2.3
1	B	398	VAL	2.3
1	A	304	ASP	2.3
1	B	272	GLY	2.2
1	B	180	PRO	2.2
1	B	415[A]	ARG	2.2
1	A	598	ASP	2.2
1	A	206	GLU	2.2
1	A	516	SER	2.2
1	B	410	PHE	2.2
1	B	416	LYS	2.2
1	A	477	TYR	2.2
1	A	162	ASP	2.2
1	B	1	SER	2.2
1	B	54	LEU	2.1
1	A	466	GLU	2.1
1	A	220	GLY	2.1
1	B	616	ALA	2.1
1	B	413	LYS	2.1
1	A	345	ARG	2.1
1	A	520[A]	SER	2.1
1	B	136	ASN	2.0
1	A	89	THR	2.0
1	A	443	ARG	2.0
1	A	302	TYR	2.0
1	A	184	GLY	2.0
1	A	583	THR	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, 95th 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	CU	A	701	1/1	1.00	0.03	15,15,15,15	0
2	CU	A	702	1/1	1.00	0.03	15,15,15,15	0
2	CU	B	701	1/1	1.00	0.05	17,17,17,17	0
2	CU	B	702	1/1	1.00	0.02	17,17,17,17	0

6.5 Other polymers [i](#)

There are no such residues in this entry.