



Full wwPDB X-ray Structure Validation Report ⓘ

May 16, 2020 – 07:58 pm BST

PDB ID : 5ZQ3
Title : PDE-Ubiquitin
Authors : Wang, Y.; Gao, A.; Gao, P.
Deposited on : 2018-04-17
Resolution : 2.18 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Xtriage (Phenix) : 1.13
EDS : 2.11
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) : 2.11

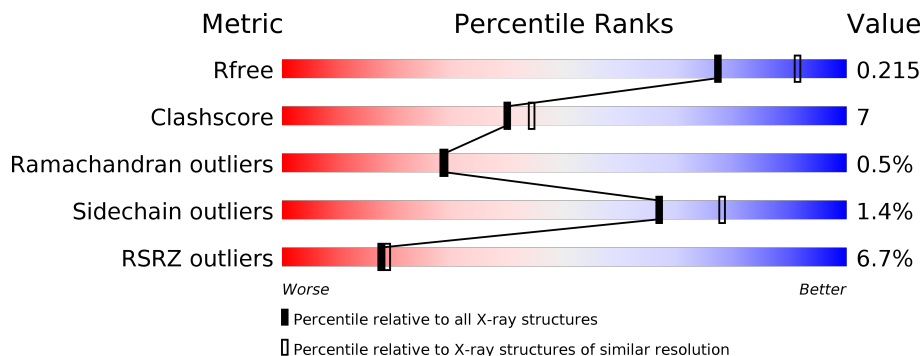
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.18 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	6864 (2.20-2.16)
Clashscore	141614	7689 (2.20-2.16)
Ramachandran outliers	138981	7564 (2.20-2.16)
Sidechain outliers	138945	7564 (2.20-2.16)
RSRZ outliers	127900	6738 (2.20-2.16)

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 on 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	377	<p>5% 78% 14% • 7%</p>
1	B	377	<p>2% 84% 8% • 7%</p>
2	C	78	<p>6% 76% 19% 5%</p>
2	D	78	<p>36% 63% 32% 5%</p>

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 7209 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 Side.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	349	Total	C	N	O	S	0	0	0
			2839	1797	492	543	7			
1	B	350	Total	C	N	O	S	0	0	0
			2844	1799	493	545	7			

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	221	MET	-	initiating methionine	UNP Q6RCR1
A	590	LEU	-	expression tag	UNP Q6RCR1
A	591	GLU	-	expression tag	UNP Q6RCR1
A	592	HIS	-	expression tag	UNP Q6RCR1
A	593	HIS	-	expression tag	UNP Q6RCR1
A	594	HIS	-	expression tag	UNP Q6RCR1
A	595	HIS	-	expression tag	UNP Q6RCR1
A	596	HIS	-	expression tag	UNP Q6RCR1
A	597	HIS	-	expression tag	UNP Q6RCR1
B	221	MET	-	initiating methionine	UNP Q6RCR1
B	590	LEU	-	expression tag	UNP Q6RCR1
B	591	GLU	-	expression tag	UNP Q6RCR1
B	592	HIS	-	expression tag	UNP Q6RCR1
B	593	HIS	-	expression tag	UNP Q6RCR1
B	594	HIS	-	expression tag	UNP Q6RCR1
B	595	HIS	-	expression tag	UNP Q6RCR1
B	596	HIS	-	expression tag	UNP Q6RCR1
B	597	HIS	-	expression tag	UNP Q6RCR1

- Molecule 2 is a protein called Ubiquitin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	74	Total	C	N	O	S	0	0	0
			593	374	103	115	1			

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	D	74	593	374	103	115	1	0	0	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	-1	GLY	-	expression tag	UNP P0CG48
C	0	SER	-	expression tag	UNP P0CG48
D	-1	GLY	-	expression tag	UNP P0CG48
D	0	SER	-	expression tag	UNP P0CG48

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	A	124	124	124	0	0
3	B	188	188	188	0	0
3	C	18	18	18	0	0
3	D	10	10	10	0	0

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	96.63Å 55.89Å 99.75Å 90.00° 110.50° 90.00°	Depositor
Resolution (Å)	49.11 – 2.18 49.11 – 2.18	Depositor EDS
% Data completeness (in resolution range)	92.5 (49.11-2.18) 92.6 (49.11-2.18)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.28 (at 2.18Å)	Xtrriage
Refinement program	PHENIX 1.8.4_1496	Depositor
R, R_{free}	0.188 , 0.213 0.190 , 0.215	Depositor DCC
R_{free} test set	2405 reflections (4.96%)	wwPDB-VP
Wilson B-factor (Å ²)	28.3	Xtrriage
Anisotropy	0.051	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 48.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.014 for l,-k,h	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	7209	wwPDB-VP
Average B, all atoms (Å ²)	50.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.92% 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

5.1 Standard geometry

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	0/2904	0.46	0/3921
1	B	0.39	0/2909	0.45	0/3927
2	C	0.28	0/599	0.49	0/806
2	D	0.39	0/599	0.59	0/806
All	All	0.35	0/7011	0.47	0/9460

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	2839	0	2742	51	0
1	B	2844	0	2745	21	0
2	C	593	0	623	10	0
2	D	593	0	623	28	0
3	A	124	0	0	2	0
3	B	188	0	0	4	0
3	C	18	0	0	1	0
3	D	10	0	0	1	0
All	All	7209	0	6733	99	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 (99) 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:264:PHE:CE2	2:D:73:LEU:CD1	2.56	0.89
2:D:40:GLN:NE2	2:D:74:ARG:HB3	1.88	0.87
2:D:38:PRO:HA	2:D:41:GLN:HE21	1.42	0.81
2:D:42:ARG:HH12	2:D:72:ARG:NH1	1.80	0.79
1:A:264:PHE:CE2	2:D:73:LEU:HD13	2.19	0.77
1:A:264:PHE:CZ	2:D:73:LEU:CD1	2.68	0.77
2:D:40:GLN:HE21	2:D:74:ARG:HB3	1.50	0.74
1:A:264:PHE:CZ	2:D:73:LEU:HD12	2.25	0.72
2:C:73:LEU:HG	2:C:74:ARG:HG2	1.73	0.71
1:A:264:PHE:CB	1:A:556:ALA:HB2	2.20	0.70
2:D:68:HIS:ND1	3:D:101:HOH:O	2.25	0.69
2:D:5:VAL:HB	2:D:13:ILE:HB	1.74	0.68
2:D:22:THR:OG1	2:D:25:ASN:ND2	2.27	0.67
1:B:272:GLN:OE1	2:C:72:ARG:NH2	2.29	0.65
1:A:264:PHE:CD1	1:A:269:VAL:HG21	2.31	0.65
1:B:477:ASP:OD1	1:B:477:ASP:N	2.28	0.64
1:A:551:ASN:HD21	2:D:74:ARG:H	1.46	0.64
1:A:506:GLU:HG2	1:A:507:GLU:N	2.12	0.63
2:D:42:ARG:NH1	2:D:72:ARG:NH1	2.47	0.62
1:A:519:LYS:HA	1:A:524:GLN:HE21	1.63	0.62
2:D:38:PRO:HA	2:D:41:GLN:NE2	2.15	0.62
1:A:264:PHE:CD1	1:A:269:VAL:CG2	2.83	0.61
1:B:364:THR:HG21	3:B:780:HOH:O	1.99	0.61
1:A:549:ARG:NH1	1:B:570:GLN:OE1	2.33	0.61
1:A:264:PHE:C	1:A:266:GLY:H	2.02	0.61
1:A:264:PHE:O	1:A:266:GLY:N	2.34	0.60
2:C:42:ARG:CZ	3:C:104:HOH:O	2.50	0.59
1:B:507:GLU:O	1:B:508:ASN:HB2	2.00	0.59
1:A:263:ASN:OD1	1:A:268:MET:SD	2.64	0.56
1:A:264:PHE:HB2	1:A:556:ALA:HB2	1.88	0.56
2:D:42:ARG:HH12	2:D:72:ARG:HH12	1.50	0.55
1:A:506:GLU:HG2	1:A:507:GLU:O	2.06	0.55
1:B:538:LEU:HD12	1:B:539:PRO:HD2	1.89	0.55
1:A:345:LYS:O	1:A:349:GLN:HG3	2.07	0.54
1:B:476:GLN:HG3	1:B:477:ASP:N	2.23	0.53
1:A:264:PHE:HD1	1:A:269:VAL:CG2	2.21	0.53
1:A:334:ARG:HH21	1:A:337:GLU:HA	1.74	0.53
1:A:387:ASP:HB3	1:A:389:LYS:CE	2.39	0.53
2:D:23:ILE:HA	2:D:26:VAL:HG12	1.90	0.53
2:C:56:LEU:HD22	2:C:61:ILE:HD12	1.91	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:264:PHE:C	1:A:266:GLY:N	2.64	0.51
1:A:505:LEU:N	1:A:505:LEU:HD12	2.26	0.51
1:A:264:PHE:CE2	2:D:73:LEU:HD11	2.43	0.51
2:D:20:SER:OG	2:D:20:SER:O	2.24	0.50
2:D:40:GLN:NE2	2:D:74:ARG:CB	2.70	0.50
1:B:537:GLY:HA2	1:B:546:TYR:CZ	2.47	0.50
1:A:257:VAL:HG21	1:A:338:GLU:OE1	2.11	0.50
2:C:24:GLU:O	2:C:28:ALA:N	2.35	0.49
1:A:373:GLU:CD	1:A:373:GLU:H	2.16	0.49
1:A:455:PHE:CD1	1:A:532:LYS:HE3	2.48	0.49
1:B:542:LYS:HD3	1:B:542:LYS:N	2.28	0.49
2:D:44:ILE:HB	2:D:68:HIS:HB2	1.95	0.49
1:A:506:GLU:HB3	1:A:509:GLN:CD	2.33	0.48
1:A:321:ARG:HD2	1:A:369:VAL:HG13	1.96	0.48
1:B:477:ASP:O	1:B:479:ASN:N	2.43	0.48
2:D:42:ARG:NH1	2:D:72:ARG:HH12	2.10	0.48
2:C:59:TYR:HB2	2:C:61:ILE:HG13	1.96	0.48
1:A:264:PHE:CE2	1:A:555:ARG:HG2	2.49	0.47
1:B:366:ILE:HA	1:B:367:PRO:HA	1.68	0.47
1:A:261:PRO:HG3	1:A:270:TYR:HD1	1.80	0.47
2:D:54:ARG:NH1	2:D:58:ASP:HB3	2.30	0.47
2:D:24:GLU:CD	2:D:52:ASP:HB3	2.35	0.46
1:A:387:ASP:O	1:A:389:LYS:HE2	2.15	0.46
2:C:63:LYS:HB3	2:C:63:LYS:HE3	1.70	0.46
2:D:41:GLN:HG2	2:D:69:LEU:HD11	1.97	0.46
1:A:572:ALA:HA	3:B:626:HOH:O	2.15	0.46
1:B:292:GLU:HB3	1:B:433:ALA:HB1	1.98	0.45
1:A:292:GLU:HB3	1:A:433:ALA:HB1	1.98	0.45
1:A:359:GLU:OE2	1:A:362:LYS:HE2	2.17	0.45
2:D:45:PHE:HB3	2:D:50:LEU:HD21	1.98	0.45
1:A:575:GLN:NE2	3:A:616:HOH:O	2.50	0.45
1:B:245:TYR:HA	1:B:249:LEU:HB2	1.98	0.45
2:D:54:ARG:CZ	2:D:58:ASP:HB3	2.47	0.45
1:A:387:ASP:HB3	1:A:389:LYS:HE2	1.98	0.45
1:B:547:LEU:HD22	2:C:71:LEU:HB3	1.99	0.44
1:A:551:ASN:ND2	2:D:73:LEU:HD22	2.33	0.44
1:A:245:TYR:HA	1:A:249:LEU:HB2	2.00	0.43
2:C:22:THR:OG1	2:C:25:ASN:OD1	2.23	0.43
1:A:264:PHE:HB3	1:A:556:ALA:HB2	1.99	0.43
1:A:264:PHE:N	1:A:267:GLN:O	2.52	0.43
1:B:261:PRO:HB3	1:B:270:TYR:CD1	2.53	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:413:PRO:HA	1:A:414:PRO:HD3	1.89	0.43
1:A:519:LYS:HE2	1:A:519:LYS:HB3	1.89	0.42
1:B:389:LYS:HB3	1:B:392:ASP:HB2	2.01	0.42
1:A:259:ALA:O	1:A:261:PRO:HD3	2.20	0.42
1:A:235:GLU:HG3	3:A:709:HOH:O	2.19	0.42
1:B:413:PRO:HA	1:B:414:PRO:HD3	1.82	0.41
1:B:567:GLY:HA2	1:B:570:GLN:HG2	2.02	0.41
1:A:477:ASP:OD1	1:A:477:ASP:N	2.53	0.41
1:A:411:LYS:HB3	1:A:417:TYR:CD2	2.56	0.41
1:A:519:LYS:HA	1:A:524:GLN:NE2	2.33	0.41
2:C:40:GLN:HE21	2:C:73:LEU:HD12	1.85	0.41
1:A:387:ASP:HB3	1:A:389:LYS:HE3	2.02	0.41
1:A:389:LYS:HB3	1:A:392:ASP:CG	2.41	0.41
1:B:409:ARG:NE	3:B:607:HOH:O	2.37	0.41
1:A:537:GLY:HA2	1:A:546:TYR:CZ	2.55	0.40
1:B:519:LYS:HE3	3:B:769:HOH:O	2.20	0.40
1:A:543:GLU:HG2	2:D:11:LYS:CD	2.51	0.40
1:B:367:PRO:HA	1:B:370:PHE:O	2.22	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	345/377 (92%)	331 (96%)	11 (3%)	3 (1%)	17	15
1	B	346/377 (92%)	336 (97%)	10 (3%)	0	100	100
2	C	72/78 (92%)	72 (100%)	0	0	100	100
2	D	72/78 (92%)	68 (94%)	3 (4%)	1 (1%)	11	8
All	All	835/910 (92%)	807 (97%)	24 (3%)	4 (0%)	29	28

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	264	PHE
1	A	265	GLY
2	D	19	PRO
1	A	266	GLY

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	300/327 (92%)	297 (99%)	3 (1%)	76	85
1	B	301/327 (92%)	295 (98%)	6 (2%)	55	66
2	C	68/69 (99%)	67 (98%)	1 (2%)	65	76
2	D	68/69 (99%)	68 (100%)	0	100	100
All	All	737/792 (93%)	727 (99%)	10 (1%)	67	78

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

Mol	Chain	Res	Type
1	A	260	THR
1	A	504	LYS
1	A	508	ASN
1	B	339	SER
1	B	364	THR
1	B	476	GLN
1	B	504	LYS
1	B	505	LEU
1	B	506	GLU
2	C	8	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	508	ASN
1	A	524	GLN
1	A	551	ASN

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Mol	Chain	Res	Type
2	D	25	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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

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	349/377 (92%)	0.23	17 (4%) 29 31	17, 46, 91, 122	0
1	B	350/377 (92%)	0.05	7 (2%) 65 66	16, 36, 78, 114	0
2	C	74/78 (94%)	0.37	5 (6%) 17 18	30, 56, 82, 93	0
2	D	74/78 (94%)	1.97	28 (37%) 0 0	58, 95, 123, 128	0
All	All	847/910 (93%)	0.32	57 (6%) 17 18	16, 44, 99, 128	0

All (57) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	265	GLY	14.2
2	D	23	ILE	10.9
1	A	264	PHE	7.5
2	D	56	LEU	6.3
2	D	57	SER	5.9
2	D	1	MET	5.5
2	D	50	LEU	5.3
2	D	53	GLY	5.1
2	D	20	SER	5.0
1	A	478	GLY	4.5
2	D	17	VAL	4.0
2	C	74	ARG	4.0
2	D	67	LEU	3.9
1	B	484	GLU	3.8
2	D	61	ILE	3.7
2	D	43	LEU	3.7
2	D	51	GLU	3.5
2	D	19	PRO	3.4
1	A	474	ILE	3.4
2	D	4	PHE	3.4
2	D	13	ILE	3.4

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Mol	Chain	Res	Type	RSRZ
1	B	475	GLY	3.3
1	A	504	LYS	3.2
1	A	505	LEU	3.1
1	B	505	LEU	3.1
2	D	52	ASP	3.0
2	D	45	PHE	3.0
1	A	256	THR	2.9
1	A	475	GLY	2.9
2	D	22	THR	2.8
1	A	387	ASP	2.8
1	B	507	GLU	2.8
1	B	222	SER	2.7
2	D	28	ALA	2.7
1	A	386	LYS	2.7
1	A	263	ASN	2.7
2	D	64	GLU	2.7
1	A	341	LYS	2.7
1	B	530	ALA	2.7
1	A	503	LYS	2.7
1	A	339	SER	2.6
2	D	21	ASP	2.6
2	D	11	LYS	2.5
1	A	257	VAL	2.4
2	C	53	GLY	2.4
2	D	16	GLU	2.4
2	C	56	LEU	2.2
2	D	65	SER	2.2
1	B	339	SER	2.2
2	D	15	LEU	2.2
2	C	60	ASN	2.1
1	A	472	TYR	2.1
2	D	3	ILE	2.1
2	C	16	GLU	2.1
1	A	508	ASN	2.0
2	D	58	ASP	2.0
2	D	55	THR	2.0

6.2 Non-standard residues in protein, DNA, RNA chains

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no carbohydrates in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.