



Full wwPDB X-ray Structure Validation Report ⓘ

May 25, 2020 – 02:00 pm BST

PDB ID : 6CP0
Title : SdcA in complex with the E2, UbcH5C
Authors : Wasilko, D.J.; Huang, Q.; Mao, Y.
Deposited on : 2018-03-13
Resolution : 3.01 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

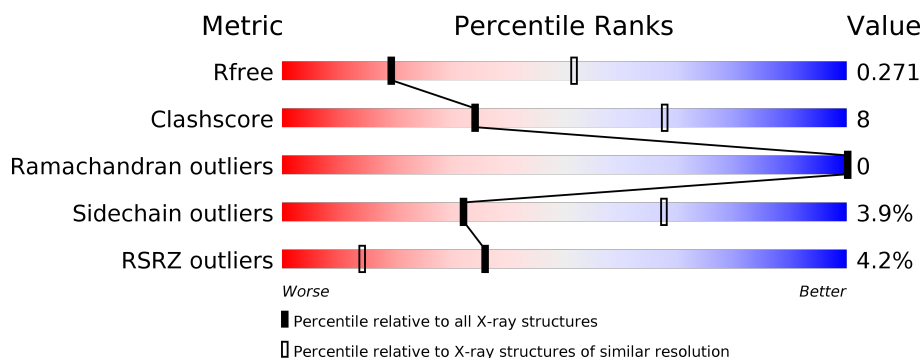
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.01 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	2399 (3.04-3.00)
Clashscore	141614	2734 (3.04-3.00)
Ramachandran outliers	138981	2640 (3.04-3.00)
Sidechain outliers	138945	2643 (3.04-3.00)
RSRZ outliers	127900	2287 (3.04-3.00)

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	538	<div> <div>3%</div> <div> <div></div> <div>77%</div> <div>17%</div> <div>• 5%</div> </div> </div>
2	B	149	<div> <div>9%</div> <div> <div></div> <div>81%</div> <div>18%</div> <div>•</div> </div> </div>

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 5378 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 SdcA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	511	Total	C	N	O	S	0	0	0
			4163	2644	704	809	6			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	45	ALA	CYS	engineered mutation	UNP Q6RCR3

- Molecule 2 is a protein called Ubiquitin-conjugating enzyme E2 D3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	149	Total	C	N	O	S	0	0	0
			1187	760	202	218	7			

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-1	LEU	-	expression tag	UNP P61077
B	0	ALA	-	expression tag	UNP P61077
B	85	SER	CYS	engineered mutation	UNP P61077

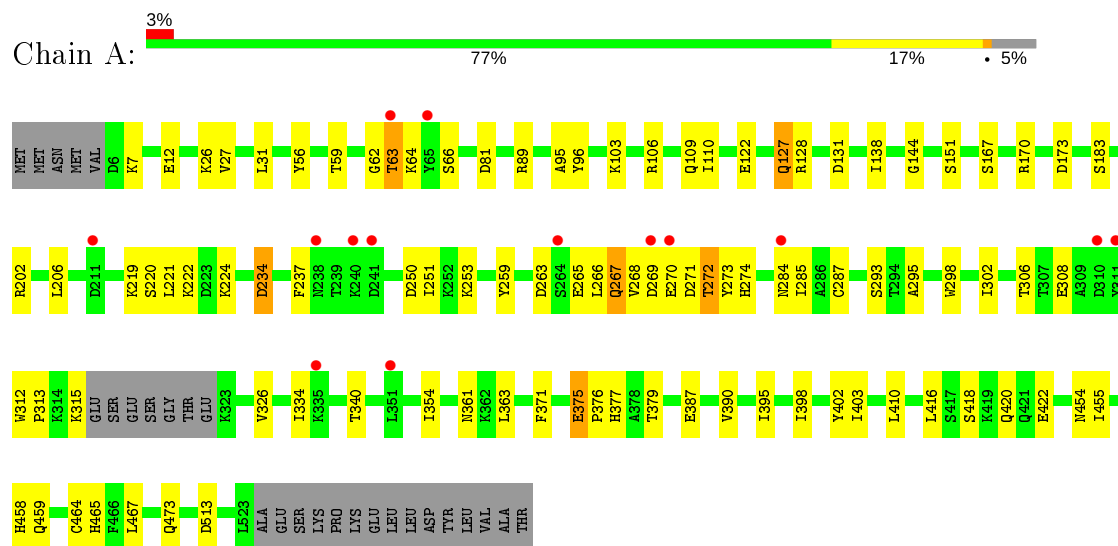
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	26	Total	O	0	0
			26	26		
3	B	2	Total	O	0	0
			2	2		

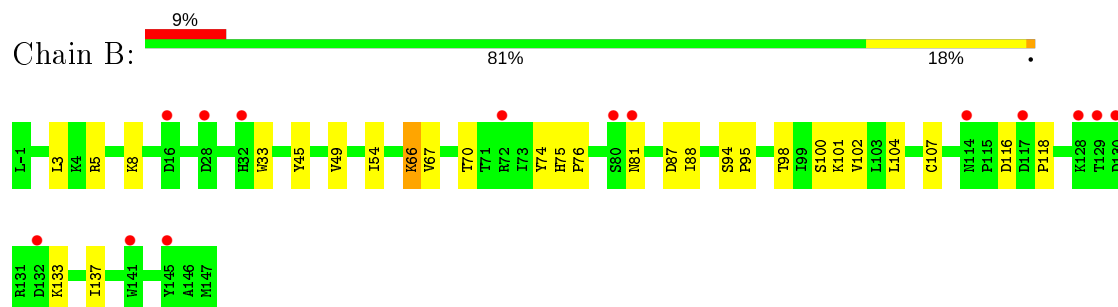
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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: SdcA



- Molecule 2: Ubiquitin-conjugating enzyme E2 D3



4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	135.55Å 142.20Å 118.34Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 3.01 22.74 – 3.01	Depositor EDS
% Data completeness (in resolution range)	96.3 (50.00-3.01) 96.6 (22.74-3.01)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.77 (at 2.99Å)	Xtriage
Refinement program	REFMAC 5.8.0049	Depositor
R, R_{free}	0.194 , 0.261 0.203 , 0.271	Depositor DCC
R_{free} test set	1140 reflections (5.13%)	wwPDB-VP
Wilson B-factor (Å ²)	69.4	Xtriage
Anisotropy	0.569	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 61.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.030 for -k,-h,-l	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	5378	wwPDB-VP
Average B, all atoms (Å ²)	80.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.06% 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	0.57	0/4247	0.75	0/5713
2	B	0.47	0/1222	0.67	0/1665
All	All	0.55	0/5469	0.73	0/7378

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	4163	0	4106	74	0
2	B	1187	0	1177	17	0
3	A	26	0	0	1	0
3	B	2	0	0	1	0
All	All	5378	0	5283	89	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 8.

All (89) 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:259:TYR:HD1	1:A:266:LEU:HD12	1.25	0.99

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:63:THR:HG23	1:A:63:THR:O	1.62	0.96
1:A:259:TYR:CD1	1:A:266:LEU:HD12	2.06	0.89
1:A:270:GLU:HB3	1:A:274:HIS:HA	1.53	0.88
1:A:259:TYR:CD1	1:A:266:LEU:CD1	2.58	0.87
1:A:127:GLN:HA	1:A:127:GLN:HE21	1.37	0.86
1:A:31:LEU:HB3	1:A:464:CYS:SG	2.16	0.85
1:A:354:ILE:HG21	1:A:403:ILE:HD13	1.67	0.76
1:A:259:TYR:HD1	1:A:266:LEU:CD1	1.95	0.75
1:A:265:GLU:OE2	1:A:266:LEU:CD2	2.36	0.74
1:A:267:GLN:HE22	1:A:270:GLU:H	1.37	0.73
1:A:265:GLU:OE2	1:A:266:LEU:HD21	1.90	0.72
1:A:259:TYR:CD1	1:A:266:LEU:HD13	2.29	0.68
1:A:354:ILE:HG21	1:A:403:ILE:CD1	2.26	0.65
1:A:219:LYS:HD2	1:A:224:LYS:HB2	1.78	0.65
1:A:273:TYR:CD2	2:B:95:PRO:HD3	2.32	0.64
1:A:59:THR:HG21	3:A:603:HOH:O	1.96	0.64
1:A:259:TYR:CE1	1:A:266:LEU:HD13	2.34	0.63
2:B:133:LYS:O	2:B:137:ILE:HD12	1.99	0.63
1:A:234:ASP:N	1:A:234:ASP:OD1	2.31	0.62
1:A:268:VAL:HG22	1:A:268:VAL:O	2.00	0.62
2:B:81:ASN:ND2	3:B:201:HOH:O	2.33	0.60
1:A:202:ARG:O	1:A:206:LEU:HB2	2.02	0.60
1:A:270:GLU:CB	1:A:274:HIS:HA	2.27	0.60
1:A:62:GLY:O	1:A:63:THR:HG22	2.02	0.59
1:A:273:TYR:CE2	2:B:95:PRO:HD3	2.38	0.59
1:A:267:GLN:NE2	1:A:270:GLU:H	1.99	0.59
1:A:56:TYR:OH	1:A:131:ASP:HA	2.04	0.57
2:B:5:ARG:O	2:B:8:LYS:HB3	2.04	0.56
2:B:75:HIS:CG	2:B:76:PRO:HD2	2.41	0.56
1:A:271:ASP:OD1	1:A:273:TYR:N	2.40	0.55
1:A:12:GLU:OE1	1:A:106:ARG:NH1	2.39	0.55
1:A:127:GLN:O	1:A:128:ARG:HB2	2.08	0.54
1:A:265:GLU:OE2	1:A:266:LEU:HD23	2.07	0.54
2:B:100:SER:OG	2:B:101:LYS:N	2.41	0.54
1:A:418:SER:O	1:A:422:GLU:HG3	2.08	0.53
1:A:375:GLU:HG3	1:A:376:PRO:HD3	1.91	0.53
1:A:272:THR:HG21	1:A:308:GLU:OE2	2.10	0.52
1:A:361:ASN:O	1:A:363:LEU:HD23	2.10	0.51
1:A:284:ASN:O	1:A:287:CYS:SG	2.67	0.51
1:A:81:ASP:OD2	1:A:103:LYS:NZ	2.42	0.51
1:A:354:ILE:HD13	1:A:403:ILE:HD12	1.92	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:285:ILE:HD12	1:A:285:ILE:N	2.26	0.50
1:A:273:TYR:C	1:A:274:HIS:CD2	2.85	0.49
1:A:270:GLU:HB3	1:A:274:HIS:CA	2.35	0.49
1:A:454:ASN:OD1	1:A:455:ILE:HG12	2.13	0.49
1:A:465:HIS:HD2	1:A:467:LEU:H	1.61	0.48
1:A:395:ILE:HA	1:A:398:ILE:HD12	1.96	0.48
1:A:267:GLN:NE2	1:A:269:ASP:N	2.62	0.48
1:A:63:THR:O	1:A:64:LYS:HG3	2.15	0.47
1:A:27:VAL:H	1:A:109:GLN:NE2	2.13	0.46
1:A:334:ILE:CG2	1:A:340:THR:HG22	2.46	0.46
2:B:133:LYS:O	2:B:137:ILE:CD1	2.64	0.45
2:B:49:VAL:O	2:B:49:VAL:HG13	2.16	0.45
1:A:167:SER:HB3	1:A:183:SER:HB3	1.98	0.45
2:B:45:TYR:OH	2:B:74:TYR:O	2.21	0.45
1:A:89:ARG:NH1	1:A:95:ALA:O	2.45	0.45
1:A:237:PHE:CZ	1:A:251:ILE:HD11	2.53	0.44
1:A:138:ILE:HG22	1:A:170:ARG:NH2	2.31	0.44
1:A:127:GLN:HA	1:A:127:GLN:NE2	2.18	0.44
2:B:33:TRP:HB2	2:B:54:ILE:HB	2.00	0.44
1:A:206:LEU:HA	1:A:340:THR:HG21	1.99	0.44
2:B:67:VAL:HG21	2:B:102:VAL:HG11	2.00	0.44
1:A:26:LYS:HA	1:A:109:GLN:HE22	1.83	0.43
2:B:75:HIS:CD2	2:B:76:PRO:HD2	2.53	0.43
1:A:267:GLN:NE2	1:A:269:ASP:H	2.17	0.43
1:A:302:ILE:O	1:A:306:THR:HG22	2.18	0.43
2:B:104:LEU:O	2:B:107:CYS:HB2	2.19	0.43
2:B:116:ASP:C	2:B:118:PRO:HD3	2.39	0.43
1:A:377:HIS:HD2	1:A:402:TYR:OH	2.02	0.43
1:A:267:GLN:C	1:A:267:GLN:NE2	2.73	0.42
1:A:220:SER:OG	1:A:222:LYS:HG2	2.19	0.42
1:A:63:THR:CG2	1:A:63:THR:O	2.34	0.42
1:A:312:TRP:H	1:A:313:PRO:HD2	1.85	0.42
1:A:63:THR:HG23	1:A:64:LYS:HG3	2.02	0.42
1:A:144:GLY:H	1:A:473:GLN:HE22	1.68	0.42
1:A:458:HIS:CD2	1:A:459:GLN:HG3	2.55	0.42
1:A:7:LYS:HA	1:A:96:TYR:OH	2.20	0.41
2:B:87:ASP:OD1	2:B:88:ILE:N	2.53	0.41
1:A:250:ASP:O	1:A:253:LYS:HB2	2.21	0.41
1:A:387:GLU:O	1:A:390:VAL:HG22	2.20	0.41
2:B:66:LYS:CE	2:B:66:LYS:HA	2.50	0.41
1:A:416:LEU:HA	1:A:420:GLN:OE1	2.21	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:371:PHE:CD1	1:A:410:LEU:HD21	2.56	0.41
1:A:273:TYR:O	1:A:274:HIS:CD2	2.74	0.40
1:A:295:ALA:O	1:A:298:TRP:HB2	2.21	0.40
1:A:312:TRP:N	1:A:313:PRO:HD2	2.37	0.40
1:A:267:GLN:HE22	1:A:270:GLU:N	2.11	0.40
1:A:219:LYS:CD	1:A:224:LYS:HB2	2.49	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	507/538 (94%)	475 (94%)	32 (6%)	0	100	100
2	B	147/149 (99%)	133 (90%)	14 (10%)	0	100	100
All	All	654/687 (95%)	608 (93%)	46 (7%)	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	456/480 (95%)	438 (96%)	18 (4%)	32	67
2	B	133/133 (100%)	128 (96%)	5 (4%)	33	68

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	589/613 (96%)	566 (96%)	23 (4%)	32 67

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

Mol	Chain	Res	Type
1	A	63	THR
1	A	66	SER
1	A	110	ILE
1	A	122	GLU
1	A	127	GLN
1	A	151	SER
1	A	173	ASP
1	A	221	LEU
1	A	234	ASP
1	A	263	ASP
1	A	267	GLN
1	A	272	THR
1	A	293	SER
1	A	315	LYS
1	A	326	VAL
1	A	375	GLU
1	A	379	THR
1	A	513	ASP
2	B	3	LEU
2	B	66	LYS
2	B	70	THR
2	B	94	SER
2	B	98	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (18) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	77	ASN
1	A	109	GLN
1	A	127	GLN
1	A	246	GLN
1	A	267	GLN
1	A	274	HIS
1	A	341	ASN
1	A	355	ASN
1	A	377	HIS

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Mol	Chain	Res	Type
1	A	406	HIS
1	A	465	HIS
1	A	473	GLN
1	A	487	GLN
1	A	491	GLN
1	A	496	ASN
1	A	502	ASN
2	B	7	ASN
2	B	34	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 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	511/538 (94%)	-0.20	14 (2%) 54 26	38, 70, 118, 149	2 (0%)
2	B	149/149 (100%)	0.18	14 (9%) 8 3	71, 95, 132, 150	0
All	All	660/687 (96%)	-0.11	28 (4%) 36 14	38, 79, 126, 150	2 (0%)

All (28) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	28	ASP	5.2
2	B	129	THR	4.0
1	A	335	LYS	3.3
2	B	128	LYS	3.1
1	A	284	ASN	3.1
1	A	351	LEU	3.1
2	B	130	ASP	3.0
1	A	238	ASN	2.9
1	A	310	ASP	2.9
1	A	63	THR	2.8
2	B	80	SER	2.7
2	B	132	ASP	2.7
2	B	141	TRP	2.6
1	A	269	ASP	2.5
2	B	117	ASP	2.5
2	B	114	ASN	2.5
2	B	145	TYR	2.4
1	A	270	GLU	2.4
1	A	240	LYS	2.3
1	A	211	ASP	2.3
1	A	311	TYR	2.3
2	B	72	ARG	2.2
1	A	65	TYR	2.1
1	A	241	ASP	2.0

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Mol	Chain	Res	Type	RSRZ
2	B	81	ASN	2.0
1	A	264	SER	2.0
2	B	16	ASP	2.0
2	B	32	HIS	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 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.