



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 6, 2024 – 11:24 AM EDT

PDB ID : 2F9T
Title : Structure of the type III CoaA from *Pseudomonas aeruginosa*
Authors : Leonardi, R.; Yun, M.K.; Chohnan, S.; White, S.W.; Rock, C.O.; Jackowski, S.
Deposited on : 2005-12-06
Resolution : 2.20 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 : 4.02b-467
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 1.20.1
EDS : 3.0
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.003 (Gargrove)
Density-Fitness : 1.0.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.39

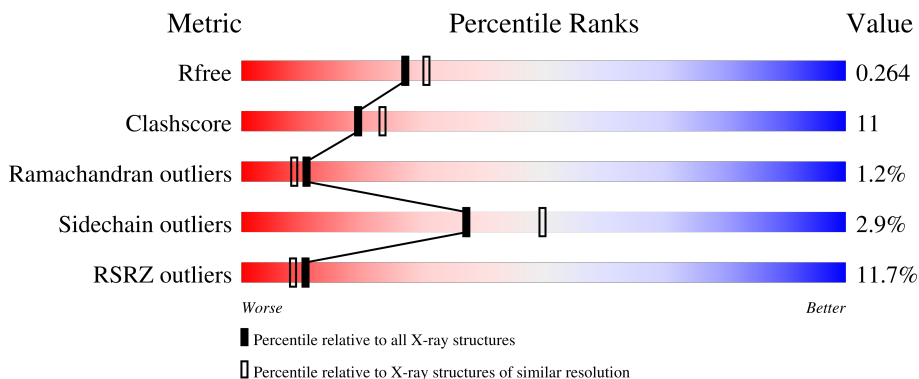
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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}	164625	5791 (2.20-2.20)
Clashscore	180529	6634 (2.20-2.20)
Ramachandran outliers	177936	6560 (2.20-2.20)
Sidechain outliers	177891	6561 (2.20-2.20)
RSRZ outliers	164620	5791 (2.20-2.20)

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	271	 4% 72% 15% • 11%
1	B	271	 17% 68% 22% • 8%

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 3816 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 Pantothenate Kinase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	S	Se			
1	A	241	1781	1116	315	336	8	6	0	0	0
1	B	248	1855	1159	337	345	8	6	0	0	0

There are 58 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-22	MSE	-	cloning artifact	UNP Q9HWC1
A	-21	GLY	-	cloning artifact	UNP Q9HWC1
A	-20	SER	-	cloning artifact	UNP Q9HWC1
A	-19	SER	-	cloning artifact	UNP Q9HWC1
A	-18	HIS	-	cloning artifact	UNP Q9HWC1
A	-17	HIS	-	cloning artifact	UNP Q9HWC1
A	-16	HIS	-	cloning artifact	UNP Q9HWC1
A	-15	HIS	-	cloning artifact	UNP Q9HWC1
A	-14	HIS	-	cloning artifact	UNP Q9HWC1
A	-13	HIS	-	cloning artifact	UNP Q9HWC1
A	-12	SER	-	cloning artifact	UNP Q9HWC1
A	-11	SER	-	cloning artifact	UNP Q9HWC1
A	-10	GLY	-	cloning artifact	UNP Q9HWC1
A	-9	LEU	-	cloning artifact	UNP Q9HWC1
A	-8	VAL	-	cloning artifact	UNP Q9HWC1
A	-7	PRO	-	cloning artifact	UNP Q9HWC1
A	-6	ARG	-	cloning artifact	UNP Q9HWC1
A	-5	GLY	-	cloning artifact	UNP Q9HWC1
A	-4	SER	-	cloning artifact	UNP Q9HWC1
A	-3	HIS	-	cloning artifact	UNP Q9HWC1
A	-2	MSE	-	cloning artifact	UNP Q9HWC1
A	-1	ALA	-	cloning artifact	UNP Q9HWC1
A	0	SER	-	cloning artifact	UNP Q9HWC1
A	1	MSE	MET	modified residue	UNP Q9HWC1
A	146	MSE	MET	modified residue	UNP Q9HWC1

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Chain	Residue	Modelled	Actual	Comment	Reference
A	149	MSE	MET	modified residue	UNP Q9HWC1
A	191	MSE	MET	modified residue	UNP Q9HWC1
A	202	MSE	MET	modified residue	UNP Q9HWC1
A	233	MSE	MET	modified residue	UNP Q9HWC1
B	-22	MSE	-	cloning artifact	UNP Q9HWC1
B	-21	GLY	-	cloning artifact	UNP Q9HWC1
B	-20	SER	-	cloning artifact	UNP Q9HWC1
B	-19	SER	-	cloning artifact	UNP Q9HWC1
B	-18	HIS	-	cloning artifact	UNP Q9HWC1
B	-17	HIS	-	cloning artifact	UNP Q9HWC1
B	-16	HIS	-	cloning artifact	UNP Q9HWC1
B	-15	HIS	-	cloning artifact	UNP Q9HWC1
B	-14	HIS	-	cloning artifact	UNP Q9HWC1
B	-13	HIS	-	cloning artifact	UNP Q9HWC1
B	-12	SER	-	cloning artifact	UNP Q9HWC1
B	-11	SER	-	cloning artifact	UNP Q9HWC1
B	-10	GLY	-	cloning artifact	UNP Q9HWC1
B	-9	LEU	-	cloning artifact	UNP Q9HWC1
B	-8	VAL	-	cloning artifact	UNP Q9HWC1
B	-7	PRO	-	cloning artifact	UNP Q9HWC1
B	-6	ARG	-	cloning artifact	UNP Q9HWC1
B	-5	GLY	-	cloning artifact	UNP Q9HWC1
B	-4	SER	-	cloning artifact	UNP Q9HWC1
B	-3	HIS	-	cloning artifact	UNP Q9HWC1
B	-2	MSE	-	cloning artifact	UNP Q9HWC1
B	-1	ALA	-	cloning artifact	UNP Q9HWC1
B	0	SER	-	cloning artifact	UNP Q9HWC1
B	1	MSE	MET	modified residue	UNP Q9HWC1
B	146	MSE	MET	modified residue	UNP Q9HWC1
B	149	MSE	MET	modified residue	UNP Q9HWC1
B	191	MSE	MET	modified residue	UNP Q9HWC1
B	202	MSE	MET	modified residue	UNP Q9HWC1
B	233	MSE	MET	modified residue	UNP Q9HWC1

- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	102	Total O 102 102	0	0
2	B	78	Total O 78 78	0	0

4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	91.25Å 91.25Å 179.20Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.98 – 2.20 49.98 – 2.20	Depositor EDS
% Data completeness (in resolution range)	95.0 (49.98-2.20) 95.1 (49.98-2.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.01	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.66 (at 2.20Å)	Xtrriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.227 , 0.268 0.222 , 0.264	Depositor DCC
R_{free} test set	1935 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	37.4	Xtrriage
Anisotropy	0.290	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 36.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	3816	wwPDB-VP
Average B, all atoms (Å ²)	44.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.59% 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](#)

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	0/1795	0.59	0/2421
1	B	0.31	0/1872	0.60	0/2525
All	All	0.32	0/3667	0.60	0/4946

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 [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	1781	0	1813	38	0
1	B	1855	0	1887	52	0
2	A	102	0	0	0	0
2	B	78	0	0	0	0
All	All	3816	0	3700	84	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 11.

All (84) 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:247:ILE:HG22	1:A:248:GLU:HG3	1.47	0.94

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:152:GLN:HG2	1:B:152:GLN:HE21	1.36	0.89
1:B:202:MSE:HE2	1:B:206:LEU:HG	1.61	0.80
1:B:36:VAL:HG13	1:B:71:LEU:HD11	1.61	0.80
1:A:0:SER:HB3	1:A:48:ARG:HD2	1.68	0.74
1:B:14:TRP:HZ3	1:B:16:VAL:HG23	1.55	0.71
1:A:91:GLY:H	1:A:137:HIS:HD2	1.42	0.66
1:B:202:MSE:HA	1:B:202:MSE:HE3	1.77	0.66
1:B:11:LEU:HD12	1:B:11:LEU:H	1.60	0.66
1:B:91:GLY:H	1:B:137:HIS:HD2	1.44	0.66
1:B:164:ASP:HB3	1:B:168:ARG:HH22	1.63	0.62
1:B:0:SER:HB2	1:B:48:ARG:HB2	1.81	0.61
1:A:0:SER:CB	1:A:48:ARG:HD2	2.31	0.60
1:A:4:GLU:OE2	1:A:51:ARG:HD2	2.03	0.59
1:A:51:ARG:HD3	1:A:241:LEU:HG	1.83	0.59
1:A:152:GLN:HG2	1:B:152:GLN:NE2	2.15	0.58
1:B:37:GLU:O	1:B:40:THR:HB	2.04	0.58
1:A:59:GLN:O	1:A:63:GLN:HG3	2.04	0.58
1:B:33:ASP:C	1:B:35:LEU:H	2.06	0.57
1:B:60:GLU:O	1:B:63:GLN:HB3	2.05	0.57
1:B:154:ARG:HG2	1:B:161:ARG:CZ	2.35	0.56
1:B:221:GLU:OE1	1:B:224:ARG:HD3	2.04	0.56
1:B:91:GLY:H	1:B:137:HIS:CD2	2.24	0.56
1:B:143:CYS:HB2	1:B:144:PRO:HD2	1.88	0.56
1:A:40:THR:O	1:A:43:GLN:HG2	2.05	0.55
1:A:122:LEU:HD22	1:A:122:LEU:N	2.23	0.54
1:B:11:LEU:HD12	1:B:11:LEU:N	2.22	0.54
1:A:191:MSE:CG	1:B:191:MSE:HG2	2.38	0.54
1:A:34:ALA:O	1:A:38:GLN:HG3	2.08	0.54
1:B:61:THR:O	1:B:65:VAL:HG23	2.07	0.54
1:B:202:MSE:HE2	1:B:206:LEU:CG	2.36	0.53
1:A:91:GLY:H	1:A:137:HIS:CD2	2.23	0.52
1:A:0:SER:HB2	1:A:48:ARG:HB2	1.92	0.52
1:A:165:ALA:O	1:A:169:ARG:HD3	2.11	0.51
1:B:0:SER:HB3	1:B:48:ARG:HD2	1.93	0.50
1:A:52:LEU:C	1:A:52:LEU:HD12	2.32	0.50
1:A:43:GLN:HA	1:A:72:PHE:HE1	1.76	0.49
1:B:43:GLN:O	1:B:44:ALA:HB2	2.12	0.49
1:B:128:SER:OG	1:B:199:GLN:NE2	2.45	0.49
1:A:143:CYS:HB2	1:A:144:PRO:HD2	1.95	0.49
1:A:150:ARG:C	1:A:152:GLN:H	2.16	0.49
1:B:10:SER:HB2	1:B:11:LEU:HD12	1.94	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:232:ILE:HD12	1:B:232:ILE:N	2.28	0.48
1:B:14:TRP:CZ3	1:B:16:VAL:HG23	2.42	0.48
1:B:12:ILE:HD11	1:B:56:ARG:HH12	1.79	0.48
1:A:2:ILE:HG12	1:A:49:ALA:HB3	1.94	0.48
1:A:104:LEU:HD13	1:A:241:LEU:HA	1.97	0.47
1:B:52:LEU:C	1:B:52:LEU:HD12	2.35	0.47
1:B:163:ASP:OD2	1:B:163:ASP:N	2.46	0.46
1:A:108:ALA:HB3	1:A:236:LEU:HD22	1.97	0.46
1:A:189:LEU:HD22	1:A:193:ARG:HG3	1.96	0.46
1:A:191:MSE:HG3	1:B:191:MSE:HG2	1.97	0.46
1:B:13:LYS:HE2	1:B:238:PHE:HE2	1.81	0.45
1:B:69:GLU:HA	1:B:69:GLU:OE1	2.16	0.45
1:A:198:GLU:OE2	1:B:197:ARG:HD2	2.16	0.45
1:B:12:ILE:HD11	1:B:56:ARG:NH1	2.32	0.45
1:A:232:ILE:HD12	1:A:232:ILE:N	2.32	0.45
1:A:143:CYS:SG	1:B:191:MSE:HE3	2.57	0.44
1:B:3:LEU:HG	1:B:5:LEU:HD11	2.00	0.44
1:B:52:LEU:HA	1:B:241:LEU:HD21	2.00	0.44
1:B:57:SER:C	1:B:59:GLN:N	2.70	0.44
1:A:97:ARG:N	1:A:97:ARG:HD2	2.32	0.43
1:A:84:GLN:HG3	1:A:88:VAL:O	2.17	0.43
1:A:150:ARG:O	1:A:152:GLN:N	2.51	0.43
1:A:247:ILE:O	1:A:248:GLU:C	2.57	0.43
1:B:130:LEU:HD12	1:B:130:LEU:N	2.33	0.43
1:A:94:ASP:OD1	1:A:97:ARG:HD3	2.19	0.42
1:B:40:THR:O	1:B:41:SER:O	2.38	0.42
1:B:89:ARG:O	1:B:137:HIS:HB3	2.19	0.42
1:A:89:ARG:O	1:A:137:HIS:HB3	2.19	0.42
1:B:35:LEU:O	1:B:39:LEU:HG	2.20	0.42
1:B:57:SER:C	1:B:59:GLN:H	2.23	0.42
1:B:40:THR:O	1:B:41:SER:C	2.57	0.42
1:B:171:LEU:HD11	1:B:185:GLU:HB3	2.02	0.41
1:B:33:ASP:C	1:B:35:LEU:N	2.73	0.41
1:B:232:ILE:N	1:B:232:ILE:CD1	2.84	0.41
1:B:36:VAL:CG1	1:B:71:LEU:HD11	2.40	0.41
1:A:43:GLN:HA	1:A:72:PHE:CE1	2.55	0.41
1:B:60:GLU:HA	1:B:63:GLN:HB3	2.03	0.41
1:A:3:LEU:HG	1:A:5:LEU:HD11	2.03	0.41
1:A:150:ARG:C	1:A:152:GLN:N	2.73	0.41
1:B:34:ALA:O	1:B:38:GLN:HB2	2.21	0.40
1:A:115:LYS:HE2	1:A:115:LYS:HB3	1.86	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:171:LEU:CD1	1:B:185:GLU:HB3	2.51	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	237/271 (88%)	232 (98%)	4 (2%)	1 (0%)	30	34
1	B	246/271 (91%)	232 (94%)	9 (4%)	5 (2%)	6	4
All	All	483/542 (89%)	464 (96%)	13 (3%)	6 (1%)	11	9

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	41	SER
1	B	44	ALA
1	A	151	SER
1	B	34	ALA
1	B	67	ARG
1	B	45	LEU

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	183/205 (89%)	178 (97%)	5 (3%)	40	53
1	B	190/205 (93%)	184 (97%)	6 (3%)	34	45
All	All	373/410 (91%)	362 (97%)	11 (3%)	37	50

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	32	ASP
1	A	97	ARG
1	A	117	CYS
1	A	189	LEU
1	A	236	LEU
1	B	47	VAL
1	B	93	LEU
1	B	117	CYS
1	B	159	ARG
1	B	163	ASP
1	B	236	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	9	ASN
1	A	43	GLN
1	A	59	GLN
1	A	84	GLN
1	A	137	HIS
1	A	175	GLN
1	A	178	GLN
1	A	199	GLN
1	B	84	GLN
1	B	137	HIS
1	B	152	GLN
1	B	178	GLN
1	B	199	GLN

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 oligosaccharides 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	235/271 (86%)	0.30	11 (4%) 37 34	26, 38, 62, 72	0
1	B	242/271 (89%)	0.70	45 (18%) 4 3	25, 40, 78, 86	0
All	All	477/542 (88%)	0.50	56 (11%) 10 8	25, 39, 72, 86	0

All (56) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	34	ALA	6.1
1	B	36	VAL	5.7
1	B	33	ASP	5.0
1	B	63	GLN	4.3
1	A	164	ASP	4.2
1	B	35	LEU	4.1
1	B	61	THR	4.0
1	B	29	ALA	4.0
1	A	-1	ALA	3.8
1	B	64	LEU	3.8
1	B	28	LEU	3.6
1	B	65	VAL	3.6
1	B	41	SER	3.6
1	B	68	LEU	3.6
1	A	154	ARG	3.6
1	B	42	GLN	3.5
1	B	67	ARG	3.4
1	A	165	ALA	3.4
1	B	44	ALA	3.4
1	A	44	ALA	3.3
1	B	30	GLU	3.3
1	B	31	SER	3.3
1	B	11	LEU	3.3
1	B	72	PHE	3.2

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Mol	Chain	Res	Type	RSRZ
1	B	39	LEU	3.1
1	B	62	SER	3.0
1	A	58	GLU	3.0
1	B	7	CYS	3.0
1	B	66	ALA	3.0
1	A	248	GLU	3.0
1	B	55	VAL	3.0
1	B	12	ILE	2.9
1	B	210	ASP	2.9
1	B	71	LEU	2.8
1	B	163	ASP	2.8
1	B	27	GLY	2.6
1	B	58	GLU	2.6
1	B	59	GLN	2.6
1	B	32	ASP	2.6
1	A	166	GLU	2.5
1	B	38	GLN	2.5
1	B	76	ALA	2.5
1	B	247	ILE	2.4
1	B	47	VAL	2.4
1	B	40	THR	2.4
1	B	74	VAL	2.4
1	A	43	GLN	2.4
1	A	0	SER	2.3
1	B	69	GLU	2.3
1	B	57	SER	2.3
1	B	73	PRO	2.2
1	B	9	ASN	2.1
1	B	70	GLN	2.1
1	B	8	GLY	2.1
1	A	151	SER	2.1
1	B	77	LEU	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](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.