



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 05:29 AM GMT

PDB ID : 2QZ9
Title : crystal structure of aspartate semialdehyde dehydrogenase II from vibrio cholerae
Authors : Viola, R.E.; Liu, X.; Ohren, J.F.; Faehnle, C.R.
Deposited on : 2007-08-16
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
<http://wwpdb.org/validation/2016/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
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

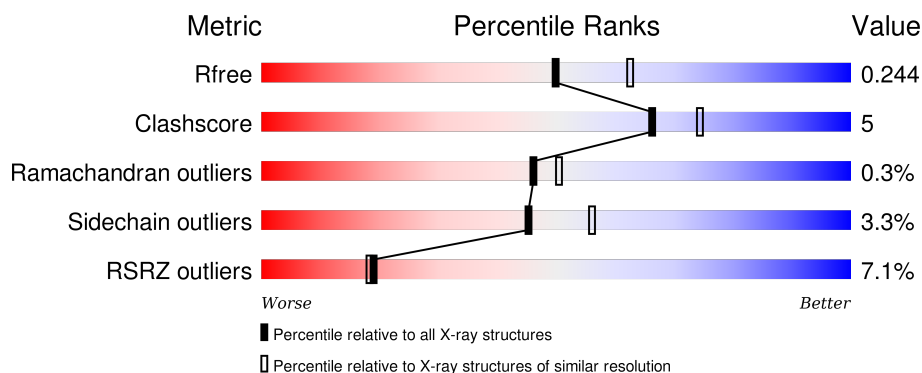
1 Overall quality at a glance ⓘ

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}	91344	3774 (2.20-2.20)
Clashscore	102246	4477 (2.20-2.20)
Ramachandran outliers	100387	4404 (2.20-2.20)
Sidechain outliers	100360	4405 (2.20-2.20)
RSRZ outliers	91569	3781 (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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	336	<div> <div>6%</div> <div>86%</div> <div>14%</div> </div>
1	B	336	<div> <div>10%</div> <div>85%</div> <div>14%</div> </div>
1	C	336	<div> <div>5%</div> <div>89%</div> <div>10%</div> </div>

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 8266 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 Aspartate-semialdehyde dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	336	Total	C	N	O	S	0	2	0
			2617	1655	447	504	11			
1	B	335	Total	C	N	O	S	0	2	0
			2611	1652	446	502	11			
1	C	336	Total	C	N	O	S	0	3	0
			2621	1657	447	506	11			

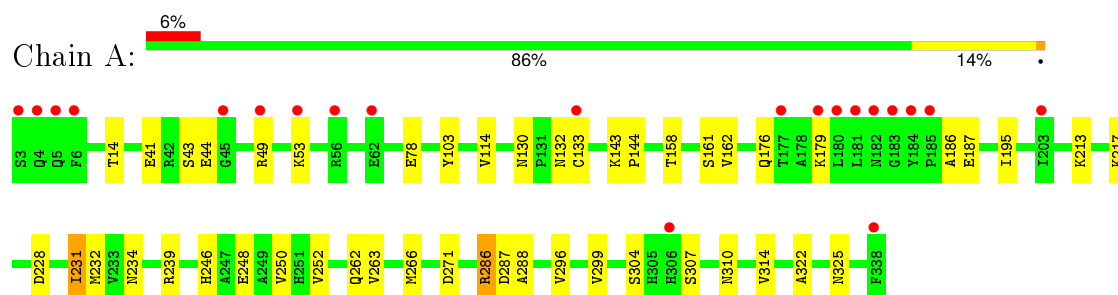
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	153	Total	O	0	0
			153	153		
2	B	103	Total	O	0	0
			103	103		
2	C	161	Total	O	0	0
			161	161		

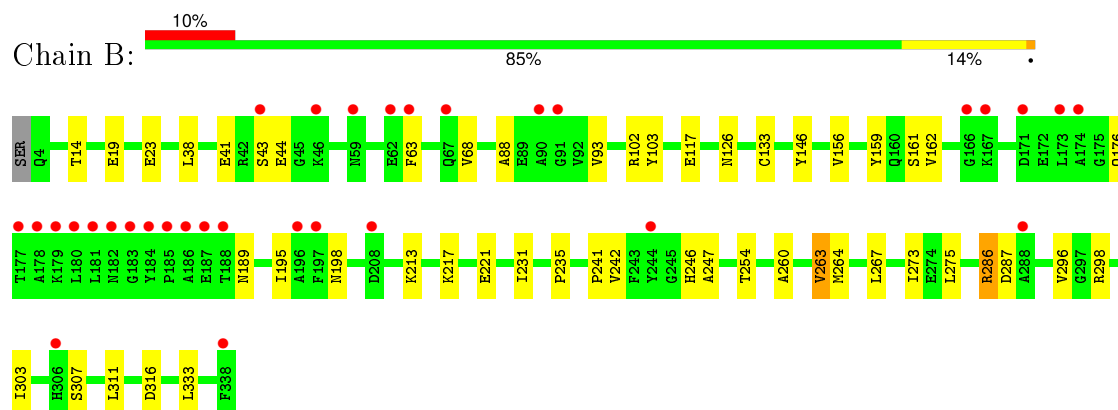
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

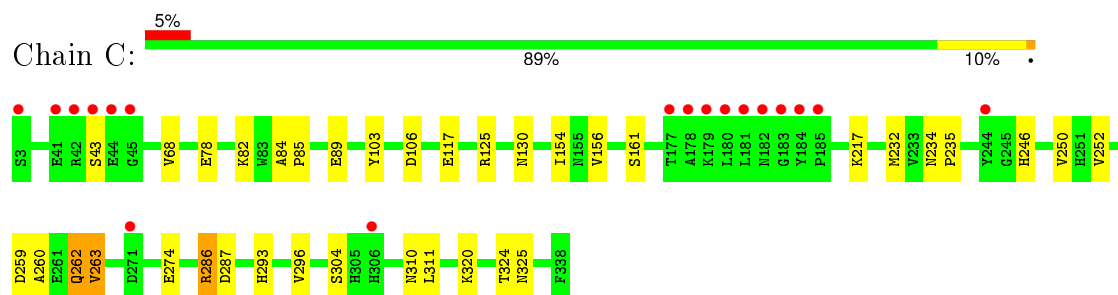
• Molecule 1: Aspartate-semialdehyde dehydrogenase



• Molecule 1: Aspartate-semialdehyde dehydrogenase



• Molecule 1: Aspartate-semialdehyde dehydrogenase



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	119.33Å 85.66Å 116.10Å 90.00° 103.69° 90.00°	Depositor
Resolution (Å)	37.61 – 2.20 37.60 – 2.20	Depositor EDS
% Data completeness (in resolution range)	99.3 (37.61-2.20) 99.2 (37.60-2.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.05	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.06 (at 2.20Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.198 , 0.250 0.195 , 0.244	Depositor DCC
R_{free} test set	2914 reflections (5.36%)	DCC
Wilson B-factor (Å ²)	39.8	Xtriage
Anisotropy	0.013	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 46.5	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 57269 reflections	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	8266	wwPDB-VP
Average B, all atoms (Å ²)	41.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.57% 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, 0.375 respectively for untwinned datasets, and 0.333, 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	0.48	0/2671	0.60	0/3633
1	B	0.45	0/2665	0.57	0/3625
1	C	0.47	0/2680	0.60	0/3645
All	All	0.47	0/8016	0.59	0/10903

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	2617	0	2538	32	0
1	B	2611	0	2533	27	0
1	C	2621	0	2540	25	0
2	A	153	0	0	3	0
2	B	103	0	0	2	0
2	C	161	0	0	2	0
All	All	8266	0	7611	75	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 5.

All (75) 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:234:ASN:HD21	1:C:310:ASN:HD21	1.00	0.93
1:B:103:TYR:OH	1:B:217:LYS:HG2	1.72	0.89
1:A:310:ASN:HD21	1:C:234:ASN:HD21	1.29	0.81
1:A:234:ASN:ND2	1:C:310:ASN:HD21	1.80	0.77
1:B:14:THR:HG21	1:B:43:SER:HB3	1.66	0.77
1:A:133:CYS:HB2	2:A:339:HOH:O	1.85	0.75
1:A:130:ASN:ND2	1:A:325:ASN:HD22	1.88	0.70
1:C:130:ASN:ND2	1:C:325:ASN:HD22	1.90	0.69
1:A:176:GLN:HE22	1:A:195:ILE:H	1.42	0.68
1:B:316:ASP:HB3	2:B:440:HOH:O	1.93	0.67
1:C:130:ASN:HD21	1:C:325:ASN:HD22	1.42	0.66
1:B:103:TYR:HH	1:B:217:LYS:HG2	1.59	0.65
1:A:310:ASN:HD21	1:C:234:ASN:ND2	1.95	0.64
1:B:102:ARG:HD3	1:B:221:GLU:OE2	1.98	0.64
1:A:103:TYR:OH	1:A:217:LYS:HG2	1.97	0.63
1:A:234:ASN:HD21	1:C:310:ASN:ND2	1.84	0.63
1:A:310:ASN:ND2	1:C:234:ASN:HD21	1.97	0.61
1:A:232:MET:HB3	1:C:304:SER:HB2	1.83	0.61
1:A:286:ARG:HD2	1:A:287:ASP:OD1	2.02	0.59
1:A:228:ASP:HB3	1:A:231:ILE:HD11	1.83	0.59
1:B:176:GLN:HE22	1:B:195:ILE:H	1.50	0.58
1:A:130:ASN:HD21	1:A:325:ASN:HD22	1.50	0.58
1:C:260:ALA:HA	1:C:263:VAL:CG1	2.34	0.57
1:B:254:THR:OG1	1:B:307:SER:HB3	2.05	0.57
1:A:304:SER:HB2	1:C:232:MET:HB3	1.87	0.56
1:C:78:GLU:CD	1:C:78:GLU:H	2.09	0.55
1:A:161:SER:H	1:A:246:HIS:HD2	1.56	0.53
1:B:198:ASN:O	1:B:241:PRO:HD3	2.07	0.53
1:B:156:VAL:O	1:B:235:PRO:HA	2.09	0.53
1:C:286:ARG:HD2	1:C:287:ASP:OD1	2.10	0.52
1:B:161:SER:H	1:B:246:HIS:HD2	1.58	0.50
1:A:133:CYS:SG	2:A:492:HOH:O	2.60	0.50
1:B:286:ARG:NH1	1:B:287:ASP:OD1	2.44	0.50
1:B:264:MET:O	1:B:275:LEU:HD22	2.11	0.50
1:B:267:LEU:HD22	1:B:273:ILE:HD13	1.93	0.50
1:C:103:TYR:OH	1:C:217:LYS:HG2	2.11	0.50
1:A:161:SER:H	1:A:246:HIS:CD2	2.32	0.48
1:B:146:TYR:HE1	1:B:231:ILE:HD11	1.79	0.47
1:C:274:GLU:HB2	1:C:293:HIS:CD2	2.49	0.47
1:C:246:HIS:HE1	2:C:418:HOH:O	1.98	0.47
1:B:286:ARG:HH11	1:B:287:ASP:CG	2.18	0.47
1:C:156:VAL:O	1:C:235:PRO:HA	2.15	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:260:ALA:HA	1:B:263:VAL:HG13	1.96	0.47
1:B:275:LEU:HD12	1:B:296:VAL:HG23	1.97	0.46
1:A:162:VAL:HA	1:A:239:ARG:HD2	1.97	0.46
1:C:161:SER:H	1:C:246:HIS:HD2	1.63	0.46
1:A:246:HIS:HE1	2:A:492:HOH:O	1.99	0.46
1:B:159:TYR:HB2	1:B:247:ALA:HB3	1.97	0.46
1:A:14:THR:HG21	1:A:43:SER:HB3	1.97	0.46
1:B:267:LEU:HD13	1:B:296:VAL:HG21	1.97	0.45
1:B:38:LEU:HD21	1:B:63:PHE:CD1	2.51	0.45
1:B:162:VAL:HG22	1:B:242:VAL:O	2.16	0.45
1:B:133:CYS:HB2	2:B:340:HOH:O	2.16	0.45
1:C:250:VAL:HG12	1:C:252:VAL:HG13	1.99	0.45
1:A:263:VAL:HG23	1:A:299:VAL:HG11	1.98	0.45
1:A:78:GLU:HG3	1:B:213:LYS:HG2	1.98	0.44
1:C:320:LYS:HA	1:C:324:THR:HB	2.00	0.44
1:A:176:GLN:HG2	1:A:186:ALA:HB1	2.00	0.44
1:A:250:VAL:HG12	1:A:252:VAL:HG13	2.00	0.44
1:C:89[B]:GLU:HG2	2:C:468:HOH:O	2.17	0.44
1:B:19:GLU:O	1:B:23:GLU:HG3	2.17	0.44
1:A:263:VAL:CG2	1:A:299:VAL:HG11	2.48	0.43
1:C:154:ILE:HG12	1:C:252:VAL:HG12	2.01	0.43
1:A:262:GLN:O	1:A:266:MET:HG3	2.19	0.43
1:A:158:THR:HG22	1:A:248:GLU:HG2	2.01	0.43
1:A:114:VAL:HG13	1:A:143:LYS:HD3	2.01	0.43
1:C:106:ASP:OD2	1:C:125:ARG:HD3	2.20	0.42
1:C:84:ALA:HB3	1:C:85:PRO:HD3	2.01	0.42
1:A:288:ALA:HB2	1:A:314:VAL:HG12	2.02	0.42
1:B:146:TYR:CE1	1:B:231:ILE:HD11	2.54	0.41
1:C:259:ASP:H	1:C:262:GLN:NE2	2.18	0.41
1:B:88:ALA:HB1	1:B:126:ASN:HB2	2.02	0.41
1:A:143:LYS:HB3	1:A:144:PRO:HD3	2.02	0.40
1:B:93:VAL:HG11	1:B:333:LEU:HD21	2.02	0.40
1:A:41:GLU:O	1:A:44:GLU:HB3	2.21	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	334/336 (99%)	318 (95%)	15 (4%)	1 (0%)	46	50
1	B	333/336 (99%)	314 (94%)	17 (5%)	2 (1%)	30	29
1	C	335/336 (100%)	321 (96%)	14 (4%)	0	100	100
All	All	1002/1008 (99%)	953 (95%)	46 (5%)	3 (0%)	46	50

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	41	GLU
1	A	322	ALA
1	B	44	GLU

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	279/280 (100%)	268 (96%)	11 (4%)	39	48
1	B	278/280 (99%)	270 (97%)	8 (3%)	50	62
1	C	280/280 (100%)	271 (97%)	9 (3%)	46	57
All	All	837/840 (100%)	809 (97%)	28 (3%)	45	56

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	49	ARG
1	A	53	LYS
1	A	132	ASN
1	A	179	LYS
1	A	187	GLU
1	A	213	LYS
1	A	231	ILE
1	A	271	ASP
1	A	286	ARG
1	A	296	VAL
1	A	307	SER
1	B	68	VAL
1	B	117	GLU
1	B	189	ASN
1	B	263	VAL
1	B	286	ARG
1	B	298	ARG
1	B	303	ILE
1	B	311	LEU
1	C	43	SER
1	C	68	VAL
1	C	82	LYS
1	C	117	GLU
1	C	262	GLN
1	C	263	VAL
1	C	286	ARG
1	C	296	VAL
1	C	311	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	130	ASN
1	A	155	ASN
1	A	176	GLN
1	A	202	GLN
1	A	234	ASN
1	A	246	HIS
1	B	176	GLN
1	B	194	GLN
1	B	202	GLN
1	B	234	ASN
1	B	246	HIS

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Mol	Chain	Res	Type
1	C	130	ASN
1	C	155	ASN
1	C	176	GLN
1	C	193	GLN
1	C	234	ASN
1	C	246	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 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	336/336 (100%)	0.31	21 (6%)	23 23	22, 37, 60, 75	2 (0%)
1	B	335/336 (99%)	0.48	32 (9%)	10 9	29, 44, 75, 90	2 (0%)
1	C	336/336 (100%)	0.05	18 (5%)	29 29	23, 35, 56, 67	2 (0%)
All	All	1007/1008 (99%)	0.28	71 (7%)	19 18	22, 39, 64, 90	6 (0%)

All (71) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	184	TYR	8.6
1	B	186	ALA	6.9
1	A	184	TYR	6.9
1	A	3	SER	6.4
1	B	185	PRO	5.3
1	C	43	SER	5.0
1	C	184	TYR	4.9
1	C	182	ASN	4.5
1	B	173	LEU	4.5
1	C	3	SER	4.5
1	C	42	ARG	4.4
1	B	171	ASP	4.2
1	B	181	LEU	4.1
1	A	180	LEU	4.1
1	A	185	PRO	4.0
1	A	182	ASN	3.9
1	B	182	ASN	3.9
1	B	244	TYR	3.8
1	A	179	LYS	3.7
1	C	41	GLU	3.6
1	A	181	LEU	3.5
1	B	180	LEU	3.5
1	B	166	GLY	3.5

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Mol	Chain	Res	Type	RSRZ
1	B	306	HIS	3.4
1	B	178	ALA	3.2
1	B	91	GLY	3.2
1	B	90	ALA	3.1
1	C	185	PRO	3.0
1	B	196	ALA	3.0
1	A	338	PHE	3.0
1	B	177	THR	3.0
1	C	183	GLY	3.0
1	B	188	THR	3.0
1	B	183	GLY	3.0
1	C	178	ALA	2.9
1	A	4	GLN	2.9
1	B	288	ALA	2.8
1	B	59	ASN	2.8
1	C	271	ASP	2.8
1	A	45	GLY	2.7
1	A	183	GLY	2.7
1	B	62	GLU	2.7
1	B	67	GLN	2.6
1	B	187	GLU	2.6
1	C	181	LEU	2.5
1	A	56	ARG	2.5
1	C	44	GLU	2.5
1	C	177	THR	2.5
1	A	203	ILE	2.5
1	B	179	LYS	2.5
1	A	62	GLU	2.4
1	B	338	PHE	2.4
1	A	306	HIS	2.4
1	A	49	ARG	2.4
1	B	63	PHE	2.3
1	B	167	LYS	2.3
1	A	177	THR	2.2
1	A	53	LYS	2.2
1	B	174	ALA	2.2
1	C	180	LEU	2.2
1	C	45	GLY	2.2
1	C	306	HIS	2.2
1	A	133	CYS	2.2
1	B	43	SER	2.1
1	B	46	LYS	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	6	PHE	2.1
1	C	179	LYS	2.1
1	A	5	GLN	2.1
1	B	197	PHE	2.0
1	C	244	TYR	2.0
1	B	208	ASP	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.