



Full wwPDB X-ray Structure Validation Report ⓘ

Sep 14, 2023 – 01:52 pm BST

PDB ID : 8CEI
Title : Succinyl-CoA Reductase from Clostridium kluyveri (SucD)
Authors : Pfister, P.; Diehl, C.; Erb, T.J.
Deposited on : 2023-02-02
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
Xtriage (Phenix) : 1.13
EDS : 2.35.1
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) : 2.35.1

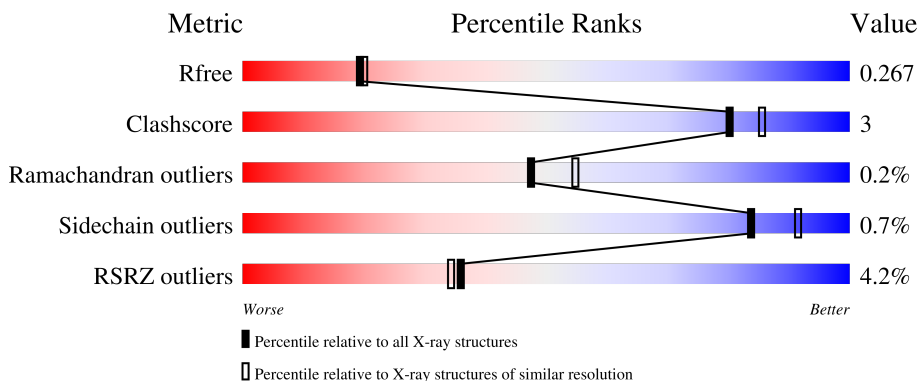
1 Overall quality at a glance

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}	130704	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (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	453	
1	B	453	
1	C	453	
1	D	453	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 14600 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 Succinate-semialdehyde dehydrogenase (acetylating).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	447	Total	C	N	O	S	0	0	0
			3394	2149	573	657	15			
1	B	447	Total	C	N	O	S	0	0	0
			3394	2149	573	657	15			
1	C	447	Total	C	N	O	S	0	0	0
			3394	2149	573	657	15			
1	D	447	Total	C	N	O	S	0	0	0
			3394	2149	573	657	15			

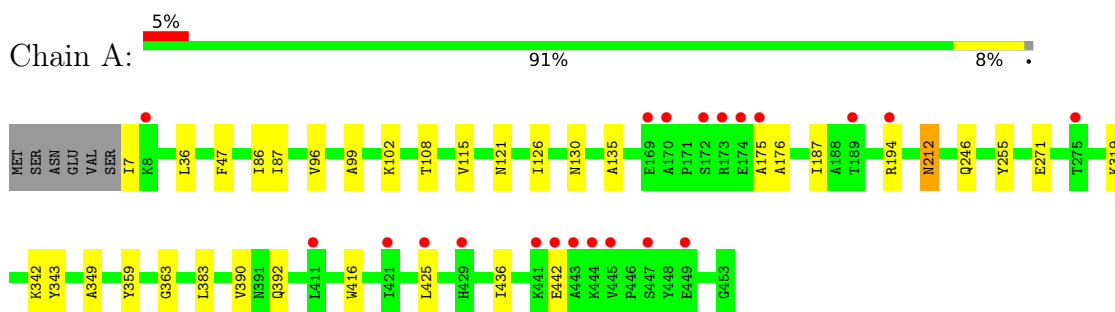
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	227	Total	O	0	0
			227	227		
2	B	259	Total	O	0	0
			259	259		
2	C	281	Total	O	0	0
			281	281		
2	D	257	Total	O	0	0
			257	257		

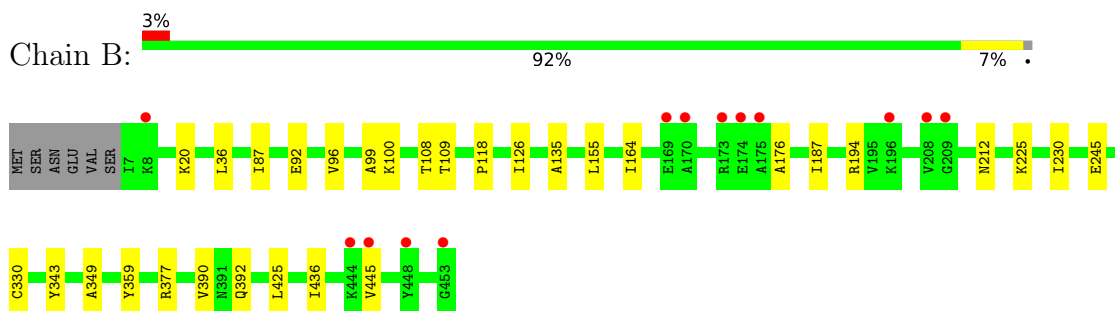
3 Residue-property plots [i](#)

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.

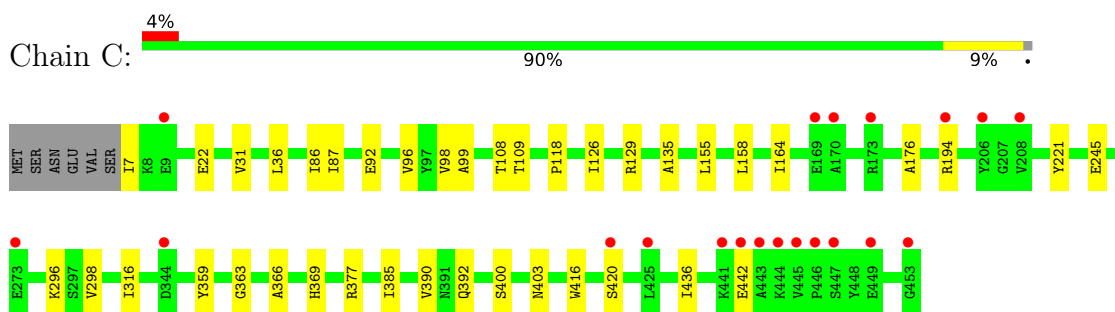
- Molecule 1: Succinate-semialdehyde dehydrogenase (acetylating)



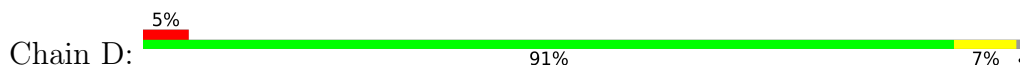
- Molecule 1: Succinate-semialdehyde dehydrogenase (acetylating)

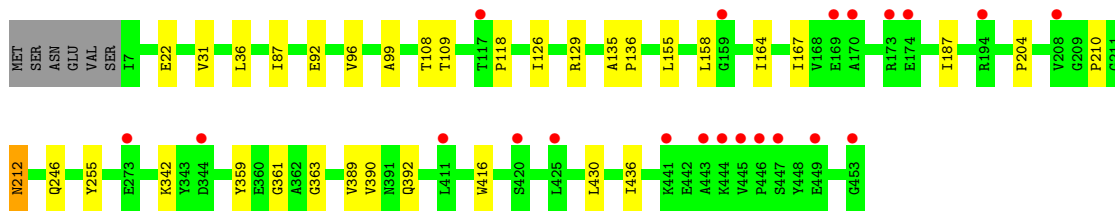


- Molecule 1: Succinate-semialdehyde dehydrogenase (acetylating)



- Molecule 1: Succinate-semialdehyde dehydrogenase (acetylating)





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	86.23Å 89.34Å 137.32Å 90.00° 104.64° 90.00°	Depositor
Resolution (Å)	39.47 – 2.20 38.77 – 2.20	Depositor EDS
% Data completeness (in resolution range)	97.5 (39.47-2.20) 98.1 (38.77-2.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.03 (at 2.20Å)	Xtrriage
Refinement program	PHENIX 1.20.1-4487	Depositor
R, R_{free}	0.242 , 0.267 0.243 , 0.267	Depositor DCC
R_{free} test set	1969 reflections (1.95%)	wwPDB-VP
Wilson B-factor (Å ²)	28.5	Xtrriage
Anisotropy	0.365	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 34.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.58$, $\langle L^2 \rangle = 0.43$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	14600	wwPDB-VP
Average B, all atoms (Å ²)	33.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 58.47 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 2.0362e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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	0.24	0/3451	0.43	0/4667
1	B	0.24	0/3451	0.43	0/4667
1	C	0.24	0/3451	0.43	0/4667
1	D	0.24	0/3451	0.43	0/4667
All	All	0.24	0/13804	0.43	0/18668

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	3394	0	3441	18	0
1	B	3394	0	3441	19	0
1	C	3394	0	3441	22	0
1	D	3394	0	3441	18	0
2	A	227	0	0	1	0
2	B	259	0	0	4	0
2	C	281	0	0	3	0
2	D	257	0	0	0	0
All	All	14600	0	13764	74	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 (74) 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:B:330:CYS:SG	2:B:501:HOH:O	2.43	0.76
1:C:36:LEU:HD11	1:C:126:ILE:HD12	1.79	0.64
1:D:36:LEU:HD11	1:D:126:ILE:HD12	1.79	0.64
1:B:36:LEU:HD11	1:B:126:ILE:HD12	1.86	0.57
1:C:296:LYS:NZ	2:C:506:HOH:O	2.38	0.57
1:C:108:THR:HG21	1:C:194:ARG:HH21	1.70	0.56
1:D:87:ILE:HD13	1:D:99:ALA:HB2	1.87	0.56
1:C:22:GLU:HA	1:C:129:ARG:HD2	1.88	0.56
1:D:96:VAL:HB	1:D:436:ILE:HB	1.88	0.54
1:A:36:LEU:HD11	1:A:126:ILE:HD12	1.89	0.54
1:B:225:LYS:NZ	2:B:517:HOH:O	2.40	0.54
1:C:87:ILE:HD13	1:C:99:ALA:HB2	1.90	0.53
1:A:271:GLU:HG3	1:A:319:LYS:HD2	1.91	0.52
1:B:20:LYS:NZ	2:B:522:HOH:O	2.43	0.51
1:A:383:LEU:O	1:B:100:LYS:HE2	2.11	0.51
1:B:194:ARG:NH1	2:B:527:HOH:O	2.45	0.50
1:C:176:ALA:HB1	1:C:194:ARG:HH22	1.76	0.49
1:B:109:THR:HG21	1:B:118:PRO:HG3	1.94	0.49
1:A:86:ILE:HD13	1:B:377:ARG:HH11	1.78	0.49
1:A:108:THR:HG22	1:A:135:ALA:HB3	1.95	0.49
1:C:7:ILE:N	2:C:516:HOH:O	2.46	0.48
1:C:363:GLY:HA3	1:C:416:TRP:HB2	1.94	0.48
1:B:108:THR:HG21	1:B:194:ARG:HH21	1.79	0.48
1:D:155:LEU:HD13	1:D:164:ILE:HD11	1.95	0.47
1:C:109:THR:HG21	1:C:118:PRO:HG3	1.96	0.47
1:A:87:ILE:HD13	1:A:99:ALA:HB2	1.97	0.47
1:A:96:VAL:HB	1:A:436:ILE:HB	1.96	0.47
1:C:31:VAL:HG12	1:C:158:LEU:HD13	1.97	0.47
1:B:87:ILE:HD13	1:B:99:ALA:HB2	1.96	0.47
1:A:343:TYR:CG	1:A:349:ALA:HB2	2.50	0.46
1:C:86:ILE:HG12	1:C:98:VAL:HG22	1.98	0.46
1:C:366:ALA:HB3	1:C:385:ILE:HD13	1.98	0.46
1:D:390:VAL:O	1:D:392:GLN:HG2	2.15	0.45
1:A:187:ILE:HD13	1:A:425:LEU:HD21	1.99	0.45
1:B:176:ALA:HB1	1:B:194:ARG:HH22	1.82	0.45
1:C:108:THR:HG22	1:C:135:ALA:HB3	1.98	0.45
1:D:31:VAL:HG12	1:D:158:LEU:HD13	2.00	0.44
1:D:389:VAL:CG1	1:D:392:GLN:HG3	2.48	0.44
1:B:108:THR:HG22	1:B:135:ALA:HB3	1.99	0.44
1:D:187:ILE:HD11	1:D:430:LEU:HD21	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:96:VAL:HB	1:C:436:ILE:HB	1.98	0.44
1:C:155:LEU:HD13	1:C:164:ILE:HD11	2.00	0.44
1:B:230:ILE:HG23	1:B:245:GLU:HG2	1.99	0.44
1:D:255:TYR:CD1	1:D:342:LYS:HG2	2.53	0.44
1:B:96:VAL:HB	1:B:436:ILE:HB	1.99	0.44
1:A:102:LYS:N	1:A:130:ASN:OD1	2.47	0.44
1:A:176:ALA:HB1	1:A:194:ARG:HH22	1.83	0.44
1:A:121:ASN:ND2	2:A:517:HOH:O	2.48	0.43
1:D:22:GLU:HA	1:D:129:ARG:HD2	2.01	0.43
1:D:363:GLY:HA3	1:D:416:TRP:HB2	2.00	0.43
1:D:389:VAL:HG12	1:D:392:GLN:HG3	2.01	0.43
1:C:298:VAL:HG13	1:C:316:ILE:HD11	2.00	0.43
1:B:155:LEU:HD13	1:B:164:ILE:HD11	2.00	0.43
1:B:187:ILE:HD13	1:B:425:LEU:HD21	2.01	0.42
1:B:390:VAL:O	1:B:392:GLN:HG2	2.19	0.42
1:C:377:ARG:NH1	2:C:520:HOH:O	2.49	0.42
1:C:245:GLU:OE1	1:C:245:GLU:N	2.52	0.42
1:B:343:TYR:CG	1:B:349:ALA:HB2	2.55	0.42
1:C:390:VAL:O	1:C:392:GLN:HG2	2.19	0.42
1:A:7:ILE:HD11	1:A:175:ALA:HB1	2.02	0.41
1:A:47:PHE:HB3	1:A:115:VAL:HG21	2.02	0.41
1:A:212:ASN:HA	1:A:246:GLN:HG3	2.02	0.41
1:D:108:THR:HG22	1:D:135:ALA:HB3	2.01	0.41
1:A:390:VAL:O	1:A:392:GLN:HG2	2.19	0.41
1:B:245:GLU:OE1	1:B:245:GLU:N	2.46	0.41
1:C:400:SER:HB3	1:C:403:ASN:ND2	2.36	0.41
1:D:109:THR:HG21	1:D:118:PRO:HG3	2.02	0.41
1:D:212:ASN:HA	1:D:246:GLN:HG3	2.02	0.41
1:A:255:TYR:CD1	1:A:342:LYS:HG2	2.56	0.41
1:C:221:TYR:CE2	1:C:369:HIS:HB3	2.56	0.41
1:A:363:GLY:HA3	1:A:416:TRP:HB2	2.03	0.41
1:C:420:SER:HA	1:D:204:PRO:HB3	2.03	0.41
1:D:136:PRO:HG3	1:D:167:ILE:HD11	2.03	0.41
1:D:210:PRO:O	1:D:361:GLY:HA2	2.20	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	445/453 (98%)	437 (98%)	7 (2%)	1 (0%)	47	55
1	B	445/453 (98%)	437 (98%)	7 (2%)	1 (0%)	47	55
1	C	445/453 (98%)	437 (98%)	8 (2%)	0	100	100
1	D	445/453 (98%)	439 (99%)	5 (1%)	1 (0%)	47	55
All	All	1780/1812 (98%)	1750 (98%)	27 (2%)	3 (0%)	47	55

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	212	ASN
1	D	212	ASN
1	B	212	ASN

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	360/366 (98%)	358 (99%)	2 (1%)	86	93
1	B	360/366 (98%)	357 (99%)	3 (1%)	81	90
1	C	360/366 (98%)	357 (99%)	3 (1%)	81	90
1	D	360/366 (98%)	358 (99%)	2 (1%)	86	93
All	All	1440/1464 (98%)	1430 (99%)	10 (1%)	84	91

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

Mol	Chain	Res	Type
1	A	359	TYR
1	A	442	GLU
1	B	92	GLU
1	B	359	TYR
1	B	445	VAL
1	C	92	GLU
1	C	359	TYR
1	C	442	GLU
1	D	92	GLU
1	D	359	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 monosaccharides 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	447/453 (98%)	0.38	21 (4%) 31 30	22, 32, 53, 103	0
1	B	447/453 (98%)	0.31	13 (2%) 51 49	21, 30, 46, 112	0
1	C	447/453 (98%)	0.42	20 (4%) 33 32	21, 30, 52, 102	0
1	D	447/453 (98%)	0.31	21 (4%) 31 30	20, 31, 50, 120	0
All	All	1788/1812 (98%)	0.36	75 (4%) 36 34	20, 30, 52, 120	0

All (75) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	170	ALA	7.4
1	B	170	ALA	6.4
1	D	169	GLU	5.5
1	A	441	LYS	5.4
1	D	170	ALA	5.3
1	B	173	ARG	5.1
1	C	173	ARG	4.9
1	D	173	ARG	4.6
1	A	173	ARG	4.5
1	C	441	LYS	4.3
1	A	175	ALA	4.2
1	B	174	GLU	4.2
1	D	441	LYS	4.1
1	D	344	ASP	3.8
1	B	175	ALA	3.7
1	B	445	VAL	3.7
1	C	449	GLU	3.6
1	A	443	ALA	3.6
1	C	170	ALA	3.5
1	A	172	SER	3.4
1	C	443	ALA	3.4

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Mol	Chain	Res	Type	RSRZ
1	C	444	LYS	3.4
1	B	444	LYS	3.2
1	A	275	THR	3.1
1	D	446	PRO	3.0
1	D	443	ALA	2.9
1	C	208	VAL	2.9
1	B	169	GLU	2.8
1	A	445	VAL	2.7
1	A	169	GLU	2.7
1	A	421	ILE	2.7
1	A	444	LYS	2.7
1	D	447	SER	2.6
1	C	169	GLU	2.6
1	C	206	TYR	2.6
1	C	344	ASP	2.6
1	D	194	ARG	2.6
1	D	449	GLU	2.6
1	C	447	SER	2.6
1	A	174	GLU	2.6
1	A	411	LEU	2.5
1	C	425	LEU	2.5
1	D	444	LYS	2.4
1	C	453	GLY	2.4
1	C	445	VAL	2.4
1	A	442	GLU	2.4
1	C	446	PRO	2.3
1	D	208	VAL	2.3
1	A	425	LEU	2.3
1	B	448	TYR	2.3
1	D	411	LEU	2.3
1	D	453	GLY	2.3
1	B	208	VAL	2.3
1	C	442	GLU	2.2
1	C	9	GLU	2.2
1	D	273	GLU	2.2
1	B	209	GLY	2.2
1	A	194	ARG	2.2
1	B	8	LYS	2.2
1	B	453	GLY	2.2
1	D	445	VAL	2.1
1	C	273	GLU	2.1
1	D	159	GLY	2.1

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Mol	Chain	Res	Type	RSRZ
1	C	194	ARG	2.1
1	D	420	SER	2.1
1	A	449	GLU	2.1
1	C	420	SER	2.1
1	D	174	GLU	2.0
1	A	189	THR	2.0
1	A	447	SER	2.0
1	B	196	LYS	2.0
1	D	425	LEU	2.0
1	A	429	HIS	2.0
1	A	8	LYS	2.0
1	D	117	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 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.