



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 12:42 PM GMT

PDB ID : 3RQG  
Title : Cerebral cavernous malformation 3 (CCM3) in complex with paxillin LD4  
Authors : Li, X.; Zhang, R.; Boggon, T.J.  
Deposited on : 2011-04-28  
Resolution : 2.50 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](mailto: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.

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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

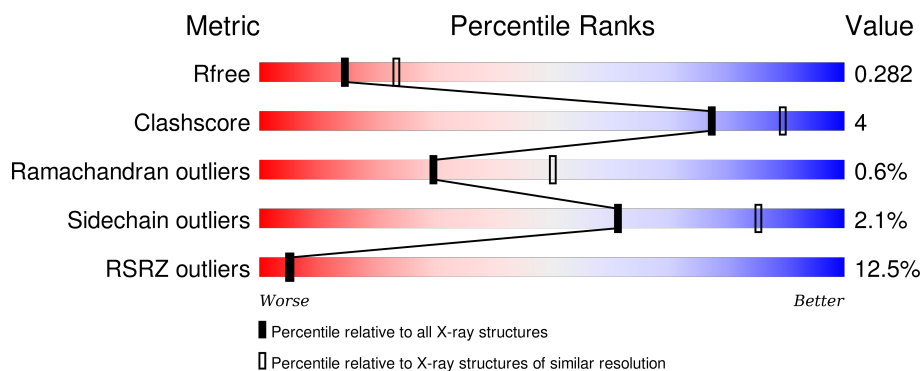
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.50 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	3553 (2.50-2.50)
Clashscore	102246	4242 (2.50-2.50)
Ramachandran outliers	100387	4156 (2.50-2.50)
Sidechain outliers	100360	4158 (2.50-2.50)
RSRZ outliers	91569	3562 (2.50-2.50)

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  $\geq 3$ , 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	214	<div> <div>6%</div> <div>81% 11% 8%</div> </div>
1	B	214	<div> <div>10%</div> <div>84% 9% 6%</div> </div>
1	C	214	<div> <div>15%</div> <div>86% 13% ..</div> </div>
1	D	214	<div> <div>15%</div> <div>86% 8% 5%</div> </div>
2	E	13	<div> <div>31%</div> <div>85% 8% 8%</div> </div>

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 6755 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 Programmed cell death protein 10.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	197	Total	C	N	O	S	0	0	0
			1611	1030	273	302	6			
1	B	201	Total	C	N	O	S	0	0	0
			1643	1047	278	312	6			
1	C	212	Total	C	N	O	S	0	0	0
			1734	1101	295	328	10			
1	D	203	Total	C	N	O	S	0	0	0
			1660	1058	281	314	7			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	EXPRESSION TAG	UNP Q9BUL8
A	0	HIS	-	EXPRESSION TAG	UNP Q9BUL8
B	-1	GLY	-	EXPRESSION TAG	UNP Q9BUL8
B	0	HIS	-	EXPRESSION TAG	UNP Q9BUL8
C	-1	GLY	-	EXPRESSION TAG	UNP Q9BUL8
C	0	HIS	-	EXPRESSION TAG	UNP Q9BUL8
D	-1	GLY	-	EXPRESSION TAG	UNP Q9BUL8
D	0	HIS	-	EXPRESSION TAG	UNP Q9BUL8

- Molecule 2 is a protein called Paxillin LD4 peptide.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	E	12	Total	C	N	O	S	0	0	0
			92	56	15	20	1			

- Molecule 3 is water.

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

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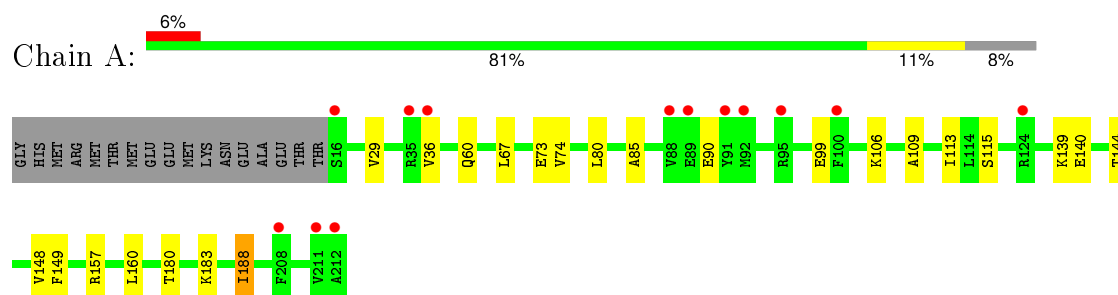
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	2	Total 2	O 2	0	0
3	C	5	Total 5	O 5	0	0
3	D	5	Total 5	O 5	0	0
3	E	1	Total 1	O 1	0	0

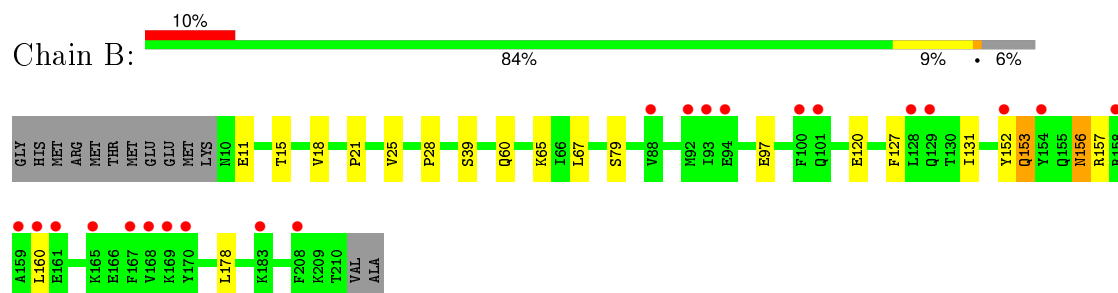
### 3 Residue-property plots [i](#)

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 ( $\text{RSRZ} > 2$ ). 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.

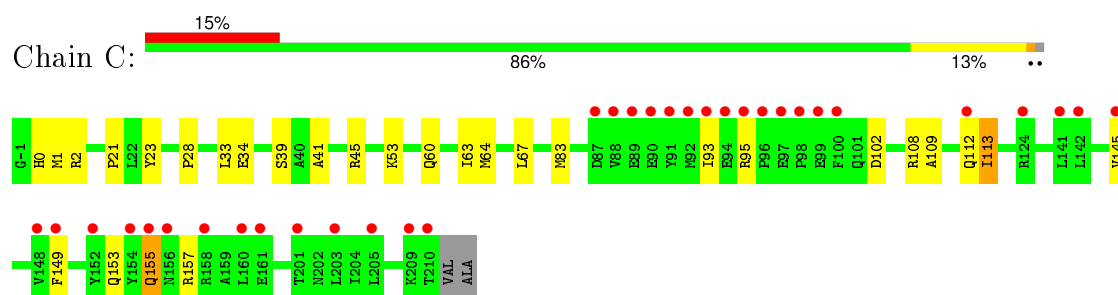
- Molecule 1: Programmed cell death protein 10



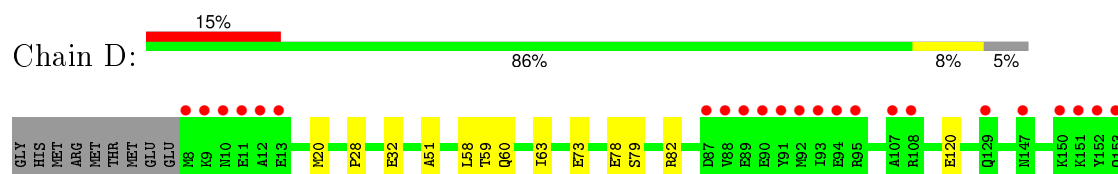
- Molecule 1: Programmed cell death protein 10

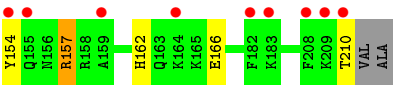


- Molecule 1: Programmed cell death protein 10

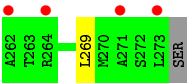
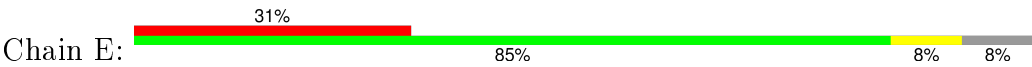


- Molecule 1: Programmed cell death protein 10





● Molecule 2: Paxillin LD4 peptide



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	62.94Å 116.16Å 124.64Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	44.28 – 2.50 44.28 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.9 (44.28-2.50) 99.9 (44.28-2.50)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	0.11	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.56 (at 2.51Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, $R_{free}$	0.241 , 0.291 0.233 , 0.282	Depositor DCC
$R_{free}$ test set	1617 reflections (5.27%)	DCC
Wilson B-factor (Å <sup>2</sup> )	62.5	Xtriage
Anisotropy	0.101	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 48.4	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 32326 reflections	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	6755	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	84.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.94% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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

### 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	0.39	0/1636	0.50	0/2200
1	B	0.38	0/1668	0.50	0/2245
1	C	0.39	0/1760	0.49	0/2364
1	D	0.38	0/1685	0.50	0/2266
2	E	0.33	0/91	0.74	0/121
All	All	0.38	0/6840	0.50	0/9196

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	1611	0	1655	16	0
1	B	1643	0	1678	13	0
1	C	1734	0	1772	18	0
1	D	1660	0	1700	11	0
2	E	92	0	92	0	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
3	C	5	0	0	0	0
3	D	5	0	0	0	0
3	E	1	0	0	0	0
All	All	6755	0	6897	50	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 4.

All (50) 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:C:33:LEU:HD11	1:D:58:LEU:HD11	1.55	0.88
1:A:106:LYS:HG3	1:A:144:THR:HG21	1.66	0.78
1:A:85:ALA:HB2	1:A:115:SER:HB3	1.71	0.72
1:D:59:THR:O	1:D:63:ILE:HG12	1.91	0.70
1:A:85:ALA:HB2	1:A:115:SER:CB	2.23	0.68
1:D:28:PRO:O	1:D:32:GLU:HG3	1.92	0.68
1:A:73:GLU:OE2	1:B:60:GLN:NE2	2.24	0.65
1:B:156:ASN:HB3	1:B:160:LEU:HD23	1.78	0.65
1:C:1:MET:HE1	1:C:45:ARG:HD3	1.80	0.64
1:A:157:ARG:HA	1:A:160:LEU:HD23	1.80	0.63
1:B:11:GLU:O	1:B:15:THR:HG23	2.00	0.62
1:A:144:THR:O	1:A:148:VAL:HG23	2.01	0.60
1:C:63:ILE:HG21	1:D:73:GLU:HG3	1.85	0.57
1:C:33:LEU:CD1	1:D:58:LEU:HD11	2.32	0.54
1:C:1:MET:HE1	1:C:45:ARG:CD	2.38	0.54
1:A:60:GLN:HA	1:A:60:GLN:HE21	1.72	0.54
1:A:74:VAL:HG22	1:A:188:ILE:HG23	1.90	0.53
1:A:139:LYS:HD3	1:A:140:GLU:HG3	1.91	0.51
1:C:60:GLN:HA	1:C:60:GLN:HE21	1.76	0.51
1:B:127:PHE:O	1:B:131:ILE:HG12	2.12	0.50
1:A:149:PHE:HE1	1:A:160:LEU:HB3	1.78	0.49
1:C:0:HIS:HB2	1:C:2:ARG:HH12	1.77	0.48
1:A:99:GLU:HB3	1:A:148:VAL:HG22	1.97	0.47
1:B:21:PRO:HG2	1:B:60:GLN:HE21	1.82	0.45
1:C:1:MET:HE3	1:C:41:ALA:O	2.16	0.45
1:D:51:ALA:HB1	1:D:58:LEU:HD23	1.98	0.45
1:C:21:PRO:HG2	1:C:60:GLN:HB2	1.99	0.45
1:B:25:VAL:C	1:B:28:PRO:HD2	2.38	0.44
1:A:109:ALA:O	1:A:113:ILE:HG13	2.17	0.44
1:C:155:GLN:HG3	1:C:157:ARG:H	1.82	0.44
1:C:1:MET:HG3	1:C:34:GLU:HG3	1.98	0.44
1:C:93:ILE:HG22	1:C:95:ARG:H	1.83	0.44
1:B:131:ILE:HD12	1:B:178:LEU:HD13	1.99	0.43
1:D:162:HIS:O	1:D:166:GLU:HG2	2.19	0.43
1:D:78:GLU:O	1:D:82:ARG:HG3	2.19	0.43
1:B:97:GLU:HG3	1:B:152:TYR:OH	2.19	0.42
1:C:109:ALA:O	1:C:113:ILE:HG12	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:180:THR:HA	1:A:183:LYS:HD2	2.01	0.42
1:C:108:ARG:O	1:C:112:GLN:HB2	2.20	0.42
1:B:79:SER:OG	1:D:79:SER:OG	2.29	0.42
1:C:113:ILE:HG12	1:C:113:ILE:H	1.70	0.42
1:B:153:GLN:OE1	1:B:157:ARG:HG3	2.20	0.41
1:A:29:VAL:HG22	1:B:65:LYS:HB3	2.03	0.41
1:C:64:MET:HE1	1:C:67:LEU:HD12	2.03	0.41
1:D:51:ALA:HB1	1:D:58:LEU:CD2	2.51	0.41
1:C:145:VAL:O	1:C:149:PHE:HB2	2.21	0.41
1:C:23:TYR:O	1:C:28:PRO:HD3	2.20	0.41
1:A:67:LEU:HD23	1:B:67:LEU:HD23	2.03	0.41
1:A:80:LEU:HD11	1:B:18:VAL:HG12	2.04	0.40
1:D:60:GLN:HE21	1:D:60:GLN:HA	1.85	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	195/214 (91%)	189 (97%)	5 (3%)	1 (0%)	34	55
1	B	199/214 (93%)	193 (97%)	5 (2%)	1 (0%)	34	55
1	C	210/214 (98%)	198 (94%)	10 (5%)	2 (1%)	19	34
1	D	201/214 (94%)	192 (96%)	8 (4%)	1 (0%)	34	55
2	E	10/13 (77%)	10 (100%)	0	0	100	100
All	All	815/869 (94%)	782 (96%)	28 (3%)	5 (1%)	30	50

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	153	GLN

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Mol	Chain	Res	Type
1	A	90	GLU
1	B	156	ASN
1	D	157	ARG
1	C	155	GLN

### 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	179/194 (92%)	177 (99%)	2 (1%)	80	94
1	B	183/194 (94%)	180 (98%)	3 (2%)	70	90
1	C	193/194 (100%)	188 (97%)	5 (3%)	54	81
1	D	185/194 (95%)	180 (97%)	5 (3%)	52	79
2	E	10/11 (91%)	9 (90%)	1 (10%)	9	18
All	All	750/787 (95%)	734 (98%)	16 (2%)	61	85

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	36	VAL
1	A	188	ILE
1	B	39	SER
1	B	120	GLU
1	B	153	GLN
1	C	39	SER
1	C	53	LYS
1	C	83	MET
1	C	102	ASP
1	C	113	ILE
1	D	20	MET
1	D	120	GLU
1	D	154	TYR
1	D	157	ARG
1	D	210	THR

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Mol	Chain	Res	Type
2	E	269	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	42	GLN
1	A	60	GLN
1	A	147	ASN
1	A	155	GLN
1	B	75	ASN
1	B	163	GLN
1	C	37	ASN
1	C	60	GLN
1	D	42	GLN
1	D	55	ASN
1	D	60	GLN
1	D	195	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

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	197/214 (92%)	0.49	13 (6%) 22 24	35, 69, 104, 132	0
1	B	201/214 (93%)	0.64	21 (10%) 8 8	38, 82, 153, 201	0
1	C	212/214 (99%)	0.98	33 (15%) 3 2	35, 69, 172, 205	0
1	D	203/214 (94%)	0.95	32 (15%) 3 2	38, 80, 163, 204	0
2	E	12/13 (92%)	1.42	4 (33%) 0 0	121, 134, 157, 162	0
All	All	825/869 (94%)	0.78	103 (12%) 5 5	35, 75, 154, 205	0

All (103) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	153	GLN	8.6
1	C	88	VAL	8.0
1	C	156	ASN	8.0
1	C	210	THR	7.9
1	C	94	GLU	7.6
1	C	154	TYR	7.4
1	D	154	TYR	7.2
2	E	262	ALA	6.9
1	D	210	THR	6.8
1	C	92	MET	6.5
1	B	208	PHE	6.2
1	C	89	GLU	6.2
1	C	91	TYR	6.0
1	C	97	GLU	5.9
1	B	152	TYR	5.9
1	C	149	PHE	5.9
1	C	93	ILE	5.8
1	C	98	PRO	5.7
1	D	208	PHE	5.3
1	C	209	LYS	5.3

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Mol	Chain	Res	Type	RSRZ
1	D	94	GLU	5.0
1	B	154	TYR	4.7
1	D	88	VAL	4.7
1	C	205	LEU	4.6
1	B	168	VAL	4.5
1	D	209	LYS	4.4
1	C	158	ARG	4.4
1	C	152	TYR	4.4
1	B	92	MET	4.4
1	D	150	LYS	4.3
1	C	100	PHE	4.1
1	D	152	TYR	4.1
1	D	147	ASN	3.8
1	D	151	LYS	3.8
1	C	96	PRO	3.8
1	C	145	VAL	3.8
1	C	141	LEU	3.6
1	C	95	ARG	3.5
1	D	182	PHE	3.4
1	B	158	ARG	3.4
1	D	164	LYS	3.2
1	D	91	TYR	3.2
2	E	273	LEU	3.2
1	A	212	ALA	3.2
1	B	128	LEU	3.2
1	A	208	PHE	3.2
1	B	94	GLU	3.2
1	D	95	ARG	3.1
1	D	90	GLU	3.1
1	D	87	ASP	3.0
1	B	100	PHE	3.0
1	D	155	GLN	3.0
1	D	107	ALA	2.9
1	D	93	ILE	2.9
2	E	271	ALA	2.8
1	A	89	GLU	2.8
1	C	148	VAL	2.8
1	D	9	LYS	2.8
1	C	87	ASP	2.7
1	B	159	ALA	2.7
1	D	183	LYS	2.7
1	A	91	TYR	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	35	ARG	2.7
1	D	129	GLN	2.7
1	B	160	LEU	2.6
1	A	36	VAL	2.6
1	C	99	GLU	2.6
1	B	161	GLU	2.6
1	D	13	GLU	2.6
1	A	95	ARG	2.6
1	B	167	PHE	2.6
1	B	170	TYR	2.6
1	A	92	MET	2.6
1	B	93	ILE	2.5
1	B	129	GLN	2.5
1	A	211	VAL	2.5
1	A	16	SER	2.5
1	A	100	PHE	2.5
1	C	90	GLU	2.5
1	C	142	LEU	2.5
1	D	108	ARG	2.5
1	B	88	VAL	2.4
1	D	12	ALA	2.4
1	D	10	ASN	2.3
1	B	183	LYS	2.3
1	B	101	GLN	2.3
1	A	124	ARG	2.3
1	C	160	LEU	2.3
1	C	161	GLU	2.2
1	D	159	ALA	2.2
1	A	88	VAL	2.2
1	D	11	GLU	2.2
1	B	169	LYS	2.2
1	C	124	ARG	2.2
1	D	92	MET	2.2
1	D	89	GLU	2.2
1	D	8	MET	2.1
1	C	203	LEU	2.1
1	C	155	GLN	2.0
2	E	264	ARG	2.0
1	B	165	LYS	2.0
1	C	112	GLN	2.0
1	C	201	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 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.