



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 12:53 PM UTC

PDB ID : 1P4O / pdb_00001p4o
Title : Structure of Apo unactivated IGF-1R KInase domain at 1.5A resolution.
Authors : Munshi, S.; Kornienko, M.; Hall, D.L.; Darke, P.L.; Waxman, L.; Kuo, L.C.
Deposited on : 2003-04-23
Resolution : 1.50 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

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	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

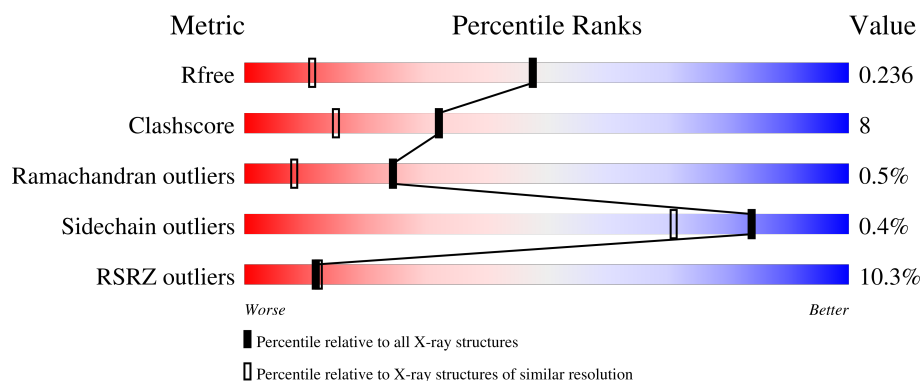
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.50 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}	180053	4037 (1.50-1.50)
Clashscore	190562	4235 (1.50-1.50)
Ramachandran outliers	187476	4153 (1.50-1.50)
Sidechain outliers	187428	4150 (1.50-1.50)
RSRZ outliers	180081	4039 (1.50-1.50)

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 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	322	11% 78% 18% .
1	B	322	8% 80% 17% ..

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 5593 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 Insulin-like growth factor I receptor protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	308	Total	C	N	O	S	0	0	0
			2455	1562	408	462	23			
1	B	314	Total	C	N	O	S	0	0	0
			2503	1593	416	471	23			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	943	MET	-	initiating methionine	UNP P08069
A	1067	ALA	GLU	engineered mutation	UNP P08069
A	1069	ALA	GLU	engineered mutation	UNP P08069
B	943	MET	-	initiating methionine	UNP P08069
B	1067	ALA	GLU	engineered mutation	UNP P08069
B	1069	ALA	GLU	engineered mutation	UNP P08069

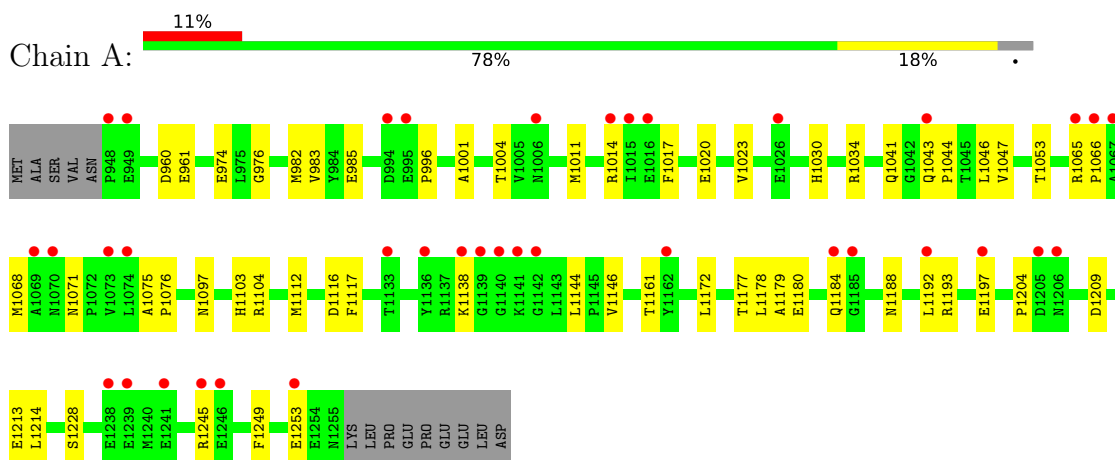
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	315	Total	O	0	0
			315	315		
2	B	320	Total	O	0	0
			320	320		

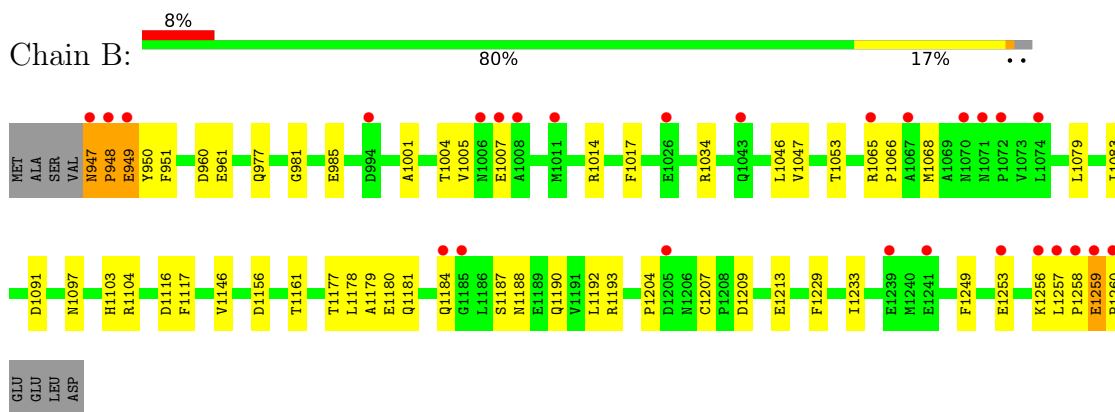
3 Residue-property plots

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: Insulin-like growth factor I receptor protein



- Molecule 1: Insulin-like growth factor I receptor protein



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	52.95Å 85.56Å 78.88Å 90.00° 99.10° 90.00°	Depositor
Resolution (Å)	20.00 – 1.50 20.00 – 1.50	Depositor EDS
% Data completeness (in resolution range)	80.3 (20.00-1.50) 80.6 (20.00-1.50)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.82 (at 1.50Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.209 , 0.236 0.209 , 0.236	Depositor DCC
R_{free} test set	10814 reflections (10.97%)	wwPDB-VP
Wilson B-factor (Å ²)	13.5	Xtriage
Anisotropy	0.098	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.44 , 49.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.55$, $\langle L^2 \rangle = 0.39$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	5593	wwPDB-VP
Average B, all atoms (Å ²)	20.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 50.68 % 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 6.2474e-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

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	0.33	0/2510	0.84	9/3390 (0.3%)
1	B	0.32	0/2560	0.85	10/3460 (0.3%)
All	All	0.32	0/5070	0.85	19/6850 (0.3%)

There are no bond length outliers.

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	1053	THR	N-CA-C	6.28	120.04	112.38
1	B	1053	THR	N-CA-C	6.28	120.04	112.38
1	B	947	ASN	CA-C-N	6.19	127.58	119.84
1	B	947	ASN	C-N-CA	6.19	127.58	119.84
1	B	1180	GLU	N-CA-C	-5.79	103.06	110.53
1	A	1249	PHE	N-CA-C	-5.64	105.21	111.36
1	A	1034	ARG	N-CA-C	5.56	119.29	109.96
1	B	1179	ALA	N-CA-C	5.51	119.24	111.52
1	B	985	GLU	N-CA-C	-5.48	100.77	109.59
1	B	1249	PHE	N-CA-C	-5.47	105.40	111.36
1	A	985	GLU	N-CA-C	-5.46	100.80	109.59
1	A	1180	GLU	N-CA-C	-5.38	103.28	110.55
1	B	1146	VAL	N-CA-C	5.33	118.53	111.17
1	B	1034	ARG	N-CA-C	5.31	118.88	109.96
1	B	1001	ALA	N-CA-C	-5.27	101.11	109.76
1	A	1146	VAL	N-CA-C	5.13	118.25	111.17
1	A	1001	ALA	N-CA-C	-5.12	101.37	109.76
1	A	1228	SER	N-CA-C	-5.06	104.00	110.53
1	A	1179	ALA	N-CA-C	5.05	118.78	111.56

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	2455	0	2412	43	0
1	B	2503	0	2461	41	0
2	A	315	0	0	5	0
2	B	320	0	0	3	0
All	All	5593	0	4873	79	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 (79) 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:1204:PRO:HG2	1:B:1207:CYS:HB2	1.52	0.91
1:A:976:GLY:H	1:A:982:MET:CE	1.97	0.77
1:A:976:GLY:N	1:A:982:MET:HE1	1.99	0.76
1:A:976:GLY:H	1:A:982:MET:HE1	1.51	0.73
1:A:1023:VAL:HG21	1:B:947:ASN:ND2	2.06	0.70
1:B:1209:ASP:O	1:B:1213:GLU:HG3	1.92	0.70
1:A:974:GLU:HB3	1:A:982:MET:HE2	1.75	0.69
1:A:982:MET:HE3	1:A:983:VAL:O	1.93	0.68
1:A:1020:GLU:CD	1:B:949:GLU:HB3	2.18	0.68
1:B:1188:ASN:O	1:B:1192:LEU:HD13	1.94	0.67
1:A:1245:ARG:HH21	1:A:1245:ARG:HB2	1.59	0.67
1:A:1245:ARG:HB2	1:A:1245:ARG:NH2	2.10	0.67
1:B:949:GLU:HG2	1:B:950:TYR:N	2.12	0.64
1:B:1065:ARG:HB3	1:B:1066:PRO:HD3	1.80	0.63
1:B:947:ASN:ND2	1:B:951:PHE:O	2.30	0.62
1:B:1097:ASN:ND2	1:B:1161:THR:OG1	2.32	0.62
1:B:1204:PRO:HG2	1:B:1207:CYS:CB	2.29	0.59
1:A:1138:LYS:HB3	1:A:1144:LEU:HD12	1.85	0.58
1:B:1187:SER:H	1:B:1190:GLN:HE21	1.52	0.57
1:A:1097:ASN:OD1	1:A:1161:THR:OG1	2.21	0.57
1:B:1068:MET:HE1	1:B:1178:LEU:HD11	1.86	0.56
1:B:1005:VAL:HG11	1:B:1014:ARG:HG2	1.87	0.56
1:A:1068:MET:HE1	1:A:1178:LEU:HD11	1.88	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1172:LEU:CD1	1:A:1214:LEU:HD22	2.37	0.55
1:A:1020:GLU:OE1	1:B:949:GLU:HB3	2.07	0.55
1:B:1017:PHE:CE2	1:B:1047:VAL:HG23	2.42	0.54
1:A:1017:PHE:CE2	1:A:1047:VAL:HG23	2.43	0.53
1:B:949:GLU:HG2	1:B:950:TYR:H	1.73	0.52
1:A:974:GLU:CB	1:A:982:MET:HE2	2.40	0.52
1:A:1172:LEU:HD11	1:A:1214:LEU:HD22	1.93	0.51
1:A:1209:ASP:O	1:A:1213:GLU:HG3	2.10	0.51
1:A:1103:HIS:O	1:A:1104:ARG:HB2	2.10	0.51
1:B:1253:GLU:HA	1:B:1256:LYS:HG3	1.92	0.51
1:B:1097:ASN:ND2	1:B:1229:PHE:HD2	2.09	0.51
1:B:1257:LEU:CD1	1:B:1260:PRO:HG3	2.41	0.50
1:B:1103:HIS:O	1:B:1104:ARG:HB2	2.12	0.50
1:A:1245:ARG:HH21	1:A:1245:ARG:CB	2.24	0.49
1:A:1071:ASN:HB2	2:A:233:HOH:O	2.11	0.49
1:B:1187:SER:H	1:B:1190:GLN:NE2	2.11	0.49
1:A:1214:LEU:HD23	1:A:1214:LEU:O	2.13	0.49
1:A:996:PRO:HG2	2:A:359:HOH:O	2.13	0.49
1:A:1030:HIS:HE1	2:A:92:HOH:O	1.96	0.48
1:A:974:GLU:HB3	1:A:982:MET:CE	2.44	0.48
1:A:1011:MET:HB2	1:B:1156:ASP:HB3	1.95	0.47
1:B:949:GLU:CG	1:B:950:TYR:H	2.25	0.47
1:B:1181:GLN:O	1:B:1184:GLN:HG3	2.14	0.47
1:A:1177:THR:HG22	1:A:1204:PRO:HB3	1.96	0.47
1:A:1188:ASN:O	1:A:1192:LEU:HG	2.15	0.47
1:B:1007:GLU:HG3	2:B:241:HOH:O	2.14	0.47
1:B:1116:ASP:O	1:B:1117:PHE:HB2	2.15	0.47
1:B:960:ASP:HB2	1:B:961:GLU:OE1	2.16	0.46
1:B:1193:ARG:HG2	2:B:556:HOH:O	2.15	0.46
1:A:1116:ASP:O	1:A:1117:PHE:HB2	2.15	0.46
1:A:976:GLY:H	1:A:982:MET:HE3	1.75	0.46
1:A:1041:GLN:NE2	1:A:1041:GLN:HA	2.31	0.45
1:B:1258:PRO:O	1:B:1259:GLU:HB3	2.17	0.45
1:A:1193:ARG:HG2	1:A:1197:GLU:OE2	2.16	0.45
1:B:1097:ASN:ND2	1:B:1229:PHE:CD2	2.84	0.45
1:B:1257:LEU:HD12	1:B:1260:PRO:HG3	1.98	0.45
1:B:1177:THR:HG22	1:B:1204:PRO:HB3	1.98	0.45
1:B:977:GLN:HE22	1:B:981:GLY:HA2	1.82	0.44
1:B:1079:LEU:O	1:B:1083:ILE:HG13	2.19	0.43
1:A:1065:ARG:N	1:A:1066:PRO:HD2	2.33	0.43
1:B:947:ASN:ND2	2:B:273:HOH:O	2.51	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1023:VAL:HG21	1:B:947:ASN:HD22	1.82	0.43
1:B:947:ASN:HA	1:B:948:PRO:HD3	1.76	0.42
1:A:1075:ALA:HB1	1:A:1076:PRO:HD2	2.02	0.42
1:A:1041:GLN:HA	1:A:1041:GLN:HE21	1.85	0.41
1:B:1259:GLU:O	1:B:1259:GLU:HG3	2.21	0.41
1:A:1004:THR:HG22	1:A:1046:LEU:HD22	2.03	0.41
1:B:1004:THR:HG22	1:B:1046:LEU:CD2	2.51	0.41
1:A:1014:ARG:NH2	1:A:1043:GLN:NE2	2.69	0.41
1:B:1091:ASP:HA	1:B:1233:ILE:HD11	2.03	0.41
1:A:1004:THR:HG22	1:A:1046:LEU:CD2	2.51	0.41
1:A:1112:MET:HE1	2:A:315:HOH:O	2.21	0.41
1:B:1177:THR:CG2	1:B:1204:PRO:HB3	2.51	0.41
1:A:1044:PRO:HG2	1:A:1046:LEU:HD21	2.01	0.40
1:A:1161:THR:HG23	2:A:163:HOH:O	2.21	0.40
1:A:960:ASP:HB2	1:A:961:GLU:OE1	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	306/322 (95%)	298 (97%)	8 (3%)	0	100	100
1	B	312/322 (97%)	302 (97%)	7 (2%)	3 (1%)	12	2
All	All	618/644 (96%)	600 (97%)	15 (2%)	3 (0%)	24	8

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	949	GLU
1	B	1259	GLU
1	B	948	PRO

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	267/280 (95%)	265 (99%)	2 (1%)	76	57
1	B	273/280 (98%)	273 (100%)	0	100	100
All	All	540/560 (96%)	538 (100%)	2 (0%)	84	71

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1184	GLN
1	A	1253	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	977	GLN
1	A	1019	ASN
1	A	1030	HIS
1	A	1041	GLN
1	A	1043	GLN
1	A	1188	ASN
1	A	1206	ASN
1	A	1220	GLN
1	B	947	ASN
1	B	977	GLN
1	B	1070	ASN
1	B	1097	ASN
1	B	1190	GLN
1	B	1220	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	308/322 (95%)	0.51	37 (12%) 9 9	8, 17, 33, 45	0
1	B	314/322 (97%)	0.45	27 (8%) 16 17	8, 16, 33, 53	0
All	All	622/644 (96%)	0.48	64 (10%) 12 12	8, 17, 33, 53	0

All (64) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	948	PRO	10.7
1	B	947	ASN	7.3
1	A	948	PRO	5.9
1	B	1260	PRO	5.2
1	B	949	GLU	4.8
1	A	1185	GLY	4.4
1	A	949	GLU	4.0
1	B	1259	GLU	3.9
1	A	1139	GLY	3.8
1	B	1256	LYS	3.7
1	A	1141	LYS	3.5
1	B	1258	PRO	3.4
1	B	1257	LEU	3.2
1	A	1184	GLN	3.1
1	A	1070	ASN	3.0
1	B	1043	GLN	3.0
1	B	1253	GLU	3.0
1	A	995	GLU	2.9
1	A	1136	TYR	2.9
1	A	1065	ARG	2.8
1	B	1184	GLN	2.8
1	A	1043	GLN	2.8
1	B	1070	ASN	2.8
1	B	1074	LEU	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	1026	GLU	2.7
1	A	1162	TYR	2.6
1	A	1239	GLU	2.6
1	A	1246	GLU	2.6
1	B	1067	ALA	2.5
1	B	1007	GLU	2.5
1	B	994	ASP	2.5
1	B	1185	GLY	2.5
1	A	1138	LYS	2.5
1	B	1026	GLU	2.5
1	A	1206	ASN	2.5
1	A	1140	GLY	2.4
1	A	1069	ALA	2.4
1	A	1142	GLY	2.4
1	A	1073	VAL	2.4
1	A	1205	ASP	2.4
1	B	1006	ASN	2.4
1	A	1245	ARG	2.3
1	B	1241	GLU	2.3
1	B	1071	ASN	2.3
1	A	994	ASP	2.3
1	A	1192	LEU	2.3
1	A	1241	GLU	2.3
1	A	1253	GLU	2.2
1	A	1006	ASN	2.2
1	A	1066	PRO	2.2
1	A	1016	GLU	2.2
1	B	1239	GLU	2.2
1	B	1065	ARG	2.2
1	B	1011	MET	2.2
1	A	1074	LEU	2.1
1	B	1008	ALA	2.1
1	B	1072	PRO	2.1
1	A	1197	GLU	2.1
1	A	1238	GLU	2.1
1	A	1067	ALA	2.1
1	A	1133	THR	2.0
1	A	1015	ILE	2.0
1	B	1205	ASP	2.0
1	A	1014	ARG	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 oligosaccharides 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.