Full wwPDB X-ray Structure Validation Report (i)

Mar 5, 2026 – 09:09 AM UTC

PDB ID	:	2NV5 / pdb_00002nv5
Title	:	Crystal structure of a C-terminal phosphatase domain of Rattus norvegicus ortholog of human protein tyrosine phosphatase, receptor type, D (PTPRD)
Authors	:	Bonanno, J.B.; Gilmore, J.; Bain, K.T.; Iizuka, M.; Xu, W.; Wasserman, S.; Smith, D.; Sauder, J.M.; Burley, S.K.; Almo, S.C.; New York SGX Research Center for Structural Genomics (NYSGXRC)
Deposited on	:	2006-11-10
Resolution	:	2.00 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 (i) 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 (1)) were used in the production of this report:

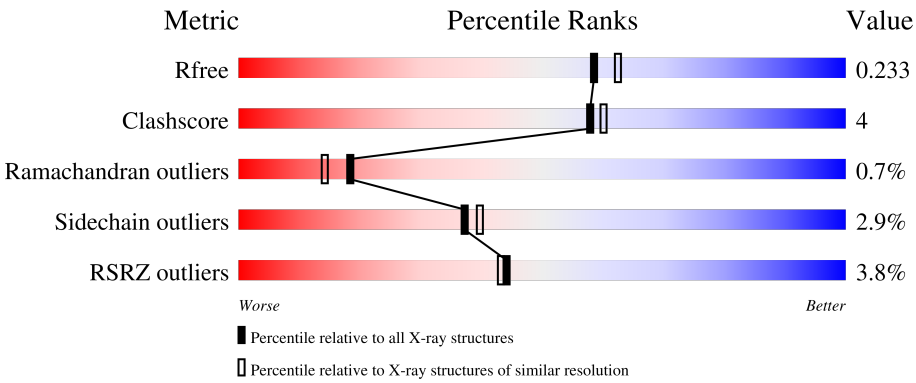
MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)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

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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	10052 (2.00-2.00)
Clashscore	190562	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (2.00-2.00)
RSRZ outliers	180081	10067 (2.00-2.00)

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 <=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	299	4% 86% 9% 5%
1	B	299	2% 85% 8% • 5%
1	C	299	5% 83% 10% • 5%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 7503 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 protein-tyrosine-phosphatase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	283	2290	1451	401	424	14	0	1	0
1	B	283	2295	1454	402	425	14	0	2	0
1	C	283	2290	1451	401	424	14	0	1	0

There are 33 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1200	MET	-	expression tag	UNP M0RB22
A	1201	SER	-	expression tag	UNP M0RB22
A	1202	LEU	-	expression tag	UNP M0RB22
A	1491	GLU	-	expression tag	UNP M0RB22
A	1492	GLY	-	expression tag	UNP M0RB22
A	1493	HIS	-	expression tag	UNP M0RB22
A	1494	HIS	-	expression tag	UNP M0RB22
A	1495	HIS	-	expression tag	UNP M0RB22
A	1496	HIS	-	expression tag	UNP M0RB22
A	1497	HIS	-	expression tag	UNP M0RB22
A	1498	HIS	-	expression tag	UNP M0RB22
B	1200	MET	-	expression tag	UNP M0RB22
B	1201	SER	-	expression tag	UNP M0RB22
B	1202	LEU	-	expression tag	UNP M0RB22
B	1491	GLU	-	expression tag	UNP M0RB22
B	1492	GLY	-	expression tag	UNP M0RB22
B	1493	HIS	-	expression tag	UNP M0RB22
B	1494	HIS	-	expression tag	UNP M0RB22
B	1495	HIS	-	expression tag	UNP M0RB22
B	1496	HIS	-	expression tag	UNP M0RB22
B	1497	HIS	-	expression tag	UNP M0RB22
B	1498	HIS	-	expression tag	UNP M0RB22
C	1200	MET	-	expression tag	UNP M0RB22

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Chain	Residue	Modelled	Actual	Comment	Reference
C	1201	SER	-	expression tag	UNP M0RB22
C	1202	LEU	-	expression tag	UNP M0RB22
C	1491	GLU	-	expression tag	UNP M0RB22
C	1492	GLY	-	expression tag	UNP M0RB22
C	1493	HIS	-	expression tag	UNP M0RB22
C	1494	HIS	-	expression tag	UNP M0RB22
C	1495	HIS	-	expression tag	UNP M0RB22
C	1496	HIS	-	expression tag	UNP M0RB22
C	1497	HIS	-	expression tag	UNP M0RB22
C	1498	HIS	-	expression tag	UNP M0RB22

- Molecule 2 is water.

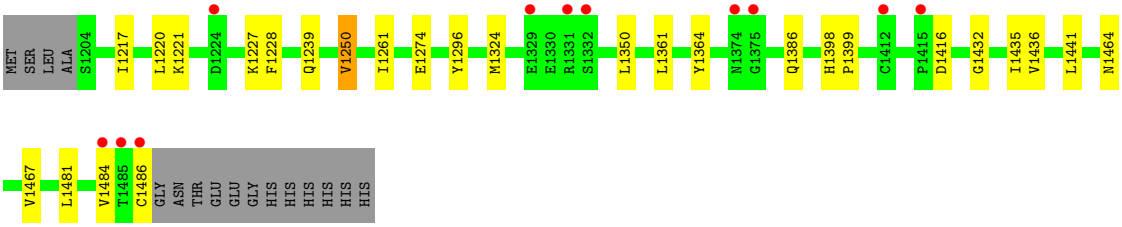
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	177	177	177	0	0
			Total	O		
2	B	244	244	244	0	0
			Total	O		
2	C	207	207	207	0	0

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.

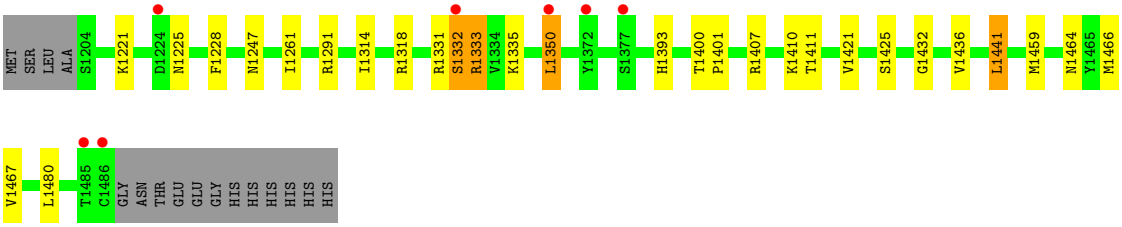
• Molecule 1: protein-tyrosine-phosphatase

Chain A:



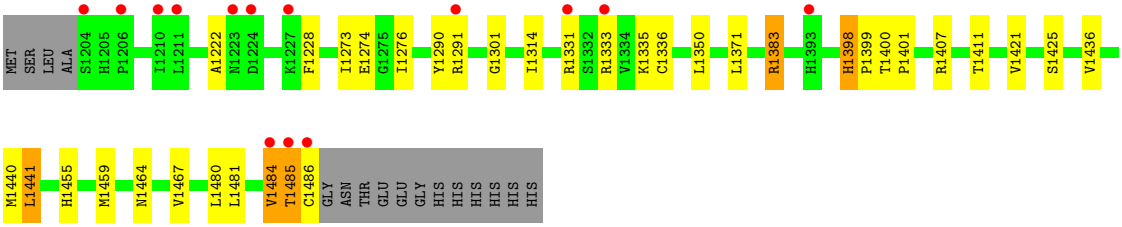
• Molecule 1: protein-tyrosine-phosphatase

Chain B:



• Molecule 1: protein-tyrosine-phosphatase

Chain C:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 61	Depositor
Cell constants a, b, c, α, β, γ	140.79Å 140.79Å 112.43Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	19.89 – 2.00 19.89 – 2.00	Depositor EDS
% Data completeness (in resolution range)	98.0 (19.89-2.00) 97.9 (19.89-2.00)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	0.13	Depositor
$< I/\sigma(I) >$ [1]	2.97 (at 2.01Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.197 , 0.237 0.199 , 0.233	Depositor DCC
R_{free} test set	4119 reflections (4.85%)	wwPDB-VP
Wilson B-factor (Å^2)	25.3	Xtriage
Anisotropy	0.043	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 42.3	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	0.075 for h,-h-k,-l	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	7503	wwPDB-VP
Average B, all atoms (Å^2)	34.0	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 40.74 % 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 2.6175e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ 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	0.76	0/2352	0.88	0/3196
1	B	0.85	0/2360	0.88	0/3207
1	C	0.83	0/2352	0.90	3/3196 (0.1%)
All	All	0.81	0/7064	0.89	3/9599 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	1398	HIS	CA-C-N	5.83	126.34	120.04
1	C	1398	HIS	C-N-CA	5.83	126.34	120.04
1	C	1301	GLY	N-CA-C	-5.22	103.72	111.03

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	2290	0	2228	12	0
1	B	2295	0	2234	26	0
1	C	2290	0	2228	23	0
2	A	177	0	0	2	0
2	B	244	0	0	7	0
2	C	207	0	0	3	0
All	All	7503	0	6690	61	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 (61) 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:1436:VAL:CG2	1:C:1459:MET:HE2	2.01	0.90
1:C:1436:VAL:HG23	1:C:1459:MET:HE2	1.61	0.82
1:A:1416:ASP:OD2	2:A:827:HOH:O	1.99	0.80
1:B:1332:SER:O	1:B:1333:ARG:HG3	1.86	0.76
1:B:1318:ARG:NE	2:B:555:HOH:O	2.04	0.75
1:C:1455:HIS:O	1:C:1459:MET:HG2	1.87	0.74
1:C:1440:MET:HE2	1:C:1440:MET:HA	1.70	0.72
1:C:1407:ARG:O	1:C:1411:THR:HG23	1.90	0.71
1:A:1250:VAL:HG22	2:A:129:HOH:O	1.95	0.67
1:B:1350:LEU:HD22	1:B:1350:LEU:N	2.14	0.63
1:B:1425:SER:HB3	2:B:309:HOH:O	2.00	0.62
1:B:1407:ARG:O	1:B:1411:THR:HG23	2.00	0.62
1:C:1436:VAL:HG22	1:C:1459:MET:HE2	1.82	0.60
1:A:1432:GLY:O	1:A:1436:VAL:HG23	2.05	0.56
1:C:1441:LEU:HD13	1:C:1480:LEU:CD2	2.36	0.55
1:B:1331:ARG:HH12	1:B:1393:HIS:CD2	2.23	0.55
1:B:1459:MET:CE	1:B:1466:MET:HE3	2.37	0.55
1:B:1318:ARG:NH1	2:B:555:HOH:O	2.39	0.55
1:B:1221:LYS:HA	1:B:1225:ASN:HD22	1.73	0.54
1:B:1410:LYS:HE3	2:B:147:HOH:O	2.07	0.54
1:B:1441:LEU:HD13	1:B:1480:LEU:HD23	1.91	0.53
1:B:1350:LEU:HD22	1:B:1350:LEU:H	1.73	0.53
1:B:1261:ILE:HD12	1:B:1261:ILE:C	2.35	0.52
1:B:1331:ARG:HH12	1:B:1393:HIS:HD2	1.58	0.52
1:C:1441:LEU:HD13	1:C:1480:LEU:HD23	1.91	0.51
1:B:1291:ARG:HD3	2:B:34:HOH:O	2.10	0.51
1:C:1484:VAL:O	1:C:1486:CYS:N	2.40	0.51
1:B:1436:VAL:HG22	1:B:1459:MET:SD	2.52	0.49
1:C:1336:CYS:HB2	2:C:130:HOH:O	2.12	0.49
1:C:1383:ARG:HD3	2:C:1010:HOH:O	2.14	0.48
1:C:1480:LEU:O	1:C:1484:VAL:HG13	2.14	0.47
1:B:1459:MET:CE	1:B:1466:MET:CE	2.92	0.47
1:A:1261:ILE:C	1:A:1261:ILE:HD12	2.40	0.47
1:C:1481:LEU:O	1:C:1485:THR:HG23	2.15	0.46
1:B:1314:ILE:HD13	1:B:1421:VAL:HG21	1.97	0.46
1:C:1314:ILE:CD1	1:C:1421:VAL:HG21	2.46	0.46
1:A:1296:TYR:CE2	1:A:1435:ILE:HG23	2.52	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1481:LEU:O	1:A:1484:VAL:HG22	2.17	0.45
1:A:1324:MET:HG2	1:A:1386:GLN:HG3	1.99	0.44
1:B:1335:LYS:HA	1:B:1335:LYS:HD2	1.85	0.44
1:A:1484:VAL:C	1:A:1486:CYS:H	2.26	0.43
1:B:1331:ARG:NH1	1:B:1393:HIS:CD2	2.85	0.43
1:B:1407:ARG:NH2	2:B:271:HOH:O	2.37	0.43
1:B:1459:MET:HE2	1:B:1466:MET:HE3	1.99	0.43
1:C:1398:HIS:HA	1:C:1399:PRO:HD3	1.74	0.43
1:C:1290:TYR:CZ	1:C:1291:ARG:HD3	2.53	0.43
1:A:1398:HIS:HA	1:A:1399:PRO:HD3	1.94	0.42
1:C:1273:ILE:HG21	1:C:1276:ILE:HD12	2.01	0.42
1:A:1217:ILE:CG2	1:A:1221:LYS:HE3	2.49	0.42
1:C:1400:THR:HB	1:C:1401:PRO:HD3	2.02	0.42
1:B:1247[B]:ASN:OD1	2:B:1013:HOH:O	2.21	0.42
1:A:1220:LEU:HA	1:A:1227:LYS:HB2	2.02	0.41
1:C:1335:LYS:HE3	1:C:1335:LYS:HB3	1.90	0.41
1:C:1222:ALA:HB3	2:C:38:HOH:O	2.21	0.41
1:A:1361:LEU:HD12	1:A:1364:TYR:CZ	2.55	0.41
1:B:1432:GLY:O	1:B:1436:VAL:HG23	2.21	0.41
1:C:1436:VAL:HG23	1:C:1459:MET:CE	2.42	0.40
1:B:1410:LYS:HA	1:B:1410:LYS:HD2	1.78	0.40
1:C:1440:MET:HA	1:C:1440:MET:CE	2.45	0.40
1:B:1400:THR:HB	1:B:1401:PRO:HD3	2.03	0.40
1:C:1273:ILE:CG2	1:C:1276:ILE:HD12	2.52	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	282/299 (94%)	269 (95%)	12 (4%)	1 (0%)	30 27

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	283/299 (95%)	271 (96%)	9 (3%)	3 (1%)	11	7
1	C	282/299 (94%)	271 (96%)	9 (3%)	2 (1%)	18	14
All	All	847/897 (94%)	811 (96%)	30 (4%)	6 (1%)	18	14

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	1332	SER
1	B	1333	ARG
1	C	1485	THR
1	B	1467	VAL
1	C	1467	VAL
1	A	1467	VAL

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	250/262 (95%)	243 (97%)	7 (3%)	38	41
1	B	251/262 (96%)	247 (98%)	4 (2%)	55	62
1	C	250/262 (95%)	239 (96%)	11 (4%)	25	24
All	All	751/786 (96%)	729 (97%)	22 (3%)	37	40

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1228	PHE
1	A	1239	GLN
1	A	1250	VAL
1	A	1274	GLU
1	A	1350	LEU
1	A	1441	LEU
1	A	1464	ASN
1	B	1228	PHE

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Mol	Chain	Res	Type
1	B	1350	LEU
1	B	1441	LEU
1	B	1464	ASN
1	C	1228	PHE
1	C	1274	GLU
1	C	1331	ARG
1	C	1333	ARG
1	C	1350	LEU
1	C	1371	LEU
1	C	1383	ARG
1	C	1425	SER
1	C	1441	LEU
1	C	1464	ASN
1	C	1484	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	1205	HIS
1	A	1223	ASN
1	A	1338	GLN
1	A	1446	HIS
1	B	1205	HIS
1	B	1225	ASN
1	B	1393	HIS
1	B	1413	ASN
1	C	1293	GLN

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 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 (i)

6.1 Protein, DNA and RNA chains (i)

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	283/299 (94%)	0.22	11 (3%)	43	42	18, 35, 53, 66	1 (0%)
1	B	283/299 (94%)	-0.17	7 (2%)	58	58	15, 28, 47, 61	2 (0%)
1	C	283/299 (94%)	0.19	14 (4%)	35	34	19, 32, 52, 62	1 (0%)
All	All	849/897 (94%)	0.08	32 (3%)	44	43	15, 31, 52, 66	4 (0%)

All (32) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1486	CYS	3.5
1	C	1331	ARG	3.5
1	A	1224	ASP	3.4
1	B	1486	CYS	3.3
1	C	1393	HIS	3.1
1	C	1484	VAL	3.1
1	C	1211	LEU	3.0
1	C	1204	SER	2.9
1	B	1350	LEU	2.9
1	A	1374	ASN	2.9
1	B	1332	SER	2.8
1	A	1412	CYS	2.8
1	A	1485	THR	2.7
1	C	1224	ASP	2.6
1	C	1485	THR	2.6
1	B	1377	SER	2.6
1	C	1206	PRO	2.5
1	A	1331	ARG	2.5
1	A	1332	SER	2.5
1	A	1375	GLY	2.5
1	C	1486	CYS	2.4
1	C	1333	ARG	2.4
1	A	1415	PRO	2.2

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Mol	Chain	Res	Type	RSRZ
1	C	1223	ASN	2.2
1	A	1329	GLU	2.2
1	B	1485	THR	2.2
1	C	1227	LYS	2.1
1	B	1224	ASP	2.1
1	B	1372	TYR	2.1
1	A	1484	VAL	2.1
1	C	1210	ILE	2.0
1	C	1291	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.