Full wwPDB X-ray Structure Validation Report ⓘ

Sep 26, 2023 – 09:51 AM EDT

PDB ID	:	6CW1
Title	:	Crystal structure of Neurexin-1 alpha ectodomain fragment, L2-L3
Authors	:	Misra, A.; Rudenko, G.
Deposited on	:	2018-03-29
Resolution	:	2.84 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:

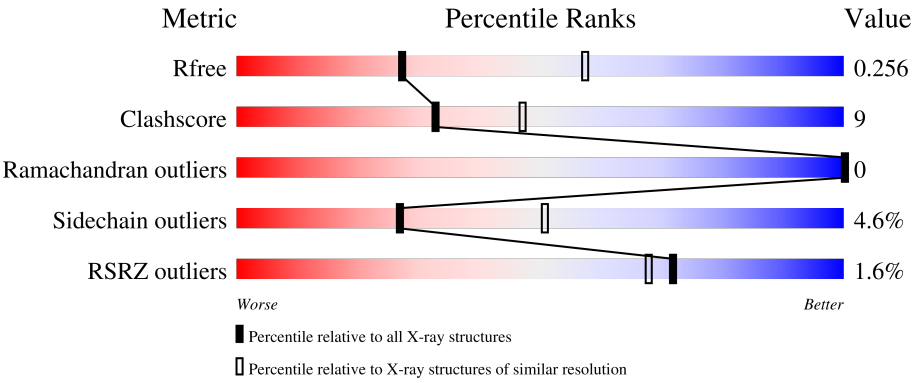
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.35.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35.1

1 Overall quality at a glance (i)

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

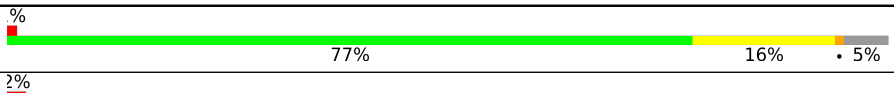
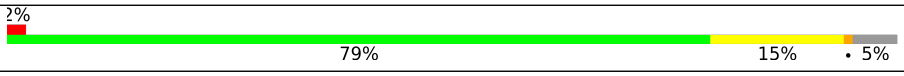
The reported resolution of this entry is 2.84 Å.

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	1031 (2.86-2.82)
Clashscore	141614	1078 (2.86-2.82)
Ramachandran outliers	138981	1050 (2.86-2.82)
Sidechain outliers	138945	1051 (2.86-2.82)
RSRZ outliers	127900	1019 (2.86-2.82)

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	402	
1	B	402	

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 5742 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 Neurexin-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	380	Total	C	N	O	S	0	0	0
			2842	1820	466	545	11			
1	B	382	Total	C	N	O	S	0	0	0
			2888	1841	478	559	10			

There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	THR	deletion	UNP Q28146
A	?	-	SER	deletion	UNP Q28146
A	?	-	GLY	deletion	UNP Q28146
A	?	-	ILE	deletion	UNP Q28146
A	?	-	GLY	deletion	UNP Q28146
A	?	-	HIS	deletion	UNP Q28146
A	?	-	ALA	deletion	UNP Q28146
A	?	-	MET	deletion	UNP Q28146
A	?	-	VAL	deletion	UNP Q28146
A	?	-	ASN	deletion	UNP Q28146
A	?	-	LYS	deletion	UNP Q28146
A	?	-	LEU	deletion	UNP Q28146
A	?	-	HIS	deletion	UNP Q28146
A	?	-	CYS	deletion	UNP Q28146
A	?	-	SER	deletion	UNP Q28146
A	612	GLU	GLN	variant	UNP Q28146
B	?	-	THR	deletion	UNP Q28146
B	?	-	SER	deletion	UNP Q28146
B	?	-	GLY	deletion	UNP Q28146
B	?	-	ILE	deletion	UNP Q28146
B	?	-	GLY	deletion	UNP Q28146
B	?	-	HIS	deletion	UNP Q28146
B	?	-	ALA	deletion	UNP Q28146
B	?	-	MET	deletion	UNP Q28146
B	?	-	VAL	deletion	UNP Q28146

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Chain	Residue	Modelled	Actual	Comment	Reference
B	?	-	ASN	deletion	UNP Q28146
B	?	-	LYS	deletion	UNP Q28146
B	?	-	LEU	deletion	UNP Q28146
B	?	-	HIS	deletion	UNP Q28146
B	?	-	CYS	deletion	UNP Q28146
B	?	-	SER	deletion	UNP Q28146
B	612	GLU	GLN	variant	UNP Q28146

- Molecule 2 is water.

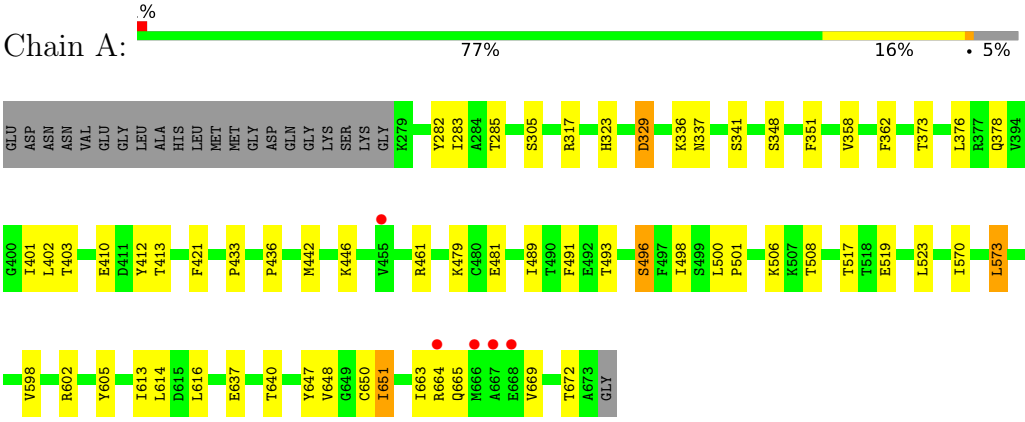
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	4	Total O 4 4	0	0
2	B	8	Total O 8 8	0	0

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.

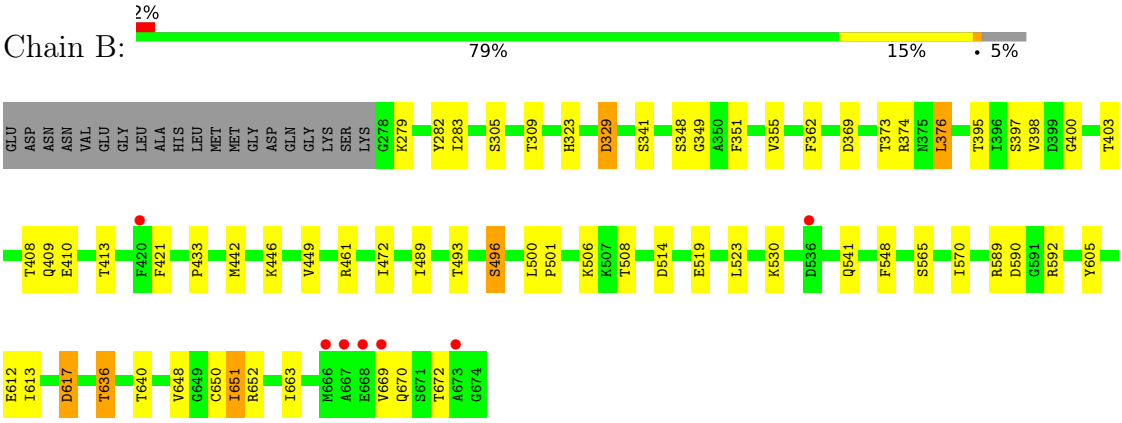
• Molecule 1: Neurexin-1

Chain A:



• Molecule 1: Neurexin-1

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	87.14Å 62.90Å 113.06Å 90.00° 97.10° 90.00°	Depositor
Resolution (Å)	50.01 – 2.84 42.13 – 2.84	Depositor EDS
% Data completeness (in resolution range)	97.9 (50.01-2.84) 97.9 (42.13-2.84)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.51 (at 2.86Å)	Xtriage
Refinement program	REFMAC 5.8.0158	Depositor
R, R_{free}	0.222 , 0.255 0.224 , 0.256	Depositor DCC
R_{free} test set	1418 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å^2)	53.7	Xtriage
Anisotropy	0.502	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 51.0	EDS
L-test for twinning[2]	$< \|L\| > = 0.46$, $< L^2 > = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.92	EDS
Total number of atoms	5742	wwPDB-VP
Average B, all atoms (Å^2)	55.0	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 19.81 % 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 9.9788e-03. 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

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	0.62	0/2905	0.72	0/3956
1	B	0.68	0/2952	0.76	0/4014
All	All	0.65	0/5857	0.74	0/7970

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	378	GLN	Mainchain

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	2842	0	2672	53	0
1	B	2888	0	2734	46	0
2	A	4	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	8	0	0	0	0
All	All	5742	0	5406	97	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 9.

All (97) 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:282:TYR:CD2	1:A:461:ARG:HA	2.12	0.85
1:A:665:GLN:O	1:A:669:VAL:HG23	1.84	0.78
1:A:282:TYR:HD2	1:A:461:ARG:HA	1.47	0.78
1:B:348:SER:HB2	1:B:410:GLU:CB	2.21	0.71
1:B:506:LYS:O	1:B:589:ARG:NH2	2.25	0.69
1:A:362:PHE:CZ	1:A:398:VAL:HG11	2.29	0.68
1:B:309:THR:HG23	1:B:449:VAL:HG13	1.76	0.66
1:A:506:LYS:O	1:A:589:ARG:NH2	2.27	0.66
1:B:309:THR:CG2	1:B:449:VAL:HG13	2.25	0.66
1:B:489:ILE:CD1	1:B:663:ILE:HG21	2.26	0.66
1:A:376:LEU:HG	1:A:413:THR:HG22	1.80	0.63
1:A:336:LYS:HD2	1:A:436:PRO:HB2	1.81	0.63
1:B:362:PHE:CZ	1:B:398:VAL:HG11	2.34	0.63
1:A:523:LEU:HB2	1:A:640:THR:CG2	2.28	0.62
1:B:523:LEU:HB2	1:B:640:THR:CG2	2.29	0.62
1:B:376:LEU:HG	1:B:413:THR:OG1	1.99	0.62
1:A:376:LEU:HG	1:A:413:THR:CG2	2.31	0.61
1:B:530:LYS:NZ	1:B:617:ASP:OD2	2.26	0.61
1:A:506:LYS:CB	1:A:613:ILE:HG23	2.31	0.60
1:B:500:LEU:HB3	1:B:501:PRO:CD	2.32	0.60
1:B:519:GLU:HG3	1:B:648:VAL:HG22	1.84	0.59
1:B:541:GLN:HA	1:B:636:THR:HG21	1.85	0.59
1:A:348:SER:HB2	1:A:410:GLU:CB	2.35	0.57
1:B:489:ILE:HD13	1:B:663:ILE:HG21	1.88	0.56
1:A:500:LEU:HB3	1:A:501:PRO:CD	2.35	0.56
1:B:506:LYS:CB	1:B:613:ILE:HG23	2.36	0.56
1:A:285:THR:OG1	1:A:479:LYS:O	2.25	0.55
1:B:519:GLU:HG3	1:B:648:VAL:CG2	2.38	0.54
1:A:573:LEU:CD2	1:A:598:VAL:HG11	2.37	0.54
1:A:395:THR:HG23	1:A:403:THR:CG2	2.37	0.54
1:A:489:ILE:HG13	1:A:663:ILE:CD1	2.38	0.53
1:B:514:ASP:HB2	1:B:652:ARG:HG2	1.91	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:329:ASP:N	1:A:329:ASP:OD1	2.44	0.51
1:B:669:VAL:HG13	1:B:670:GLN:HG3	1.91	0.51
1:B:282:TYR:CD2	1:B:461:ARG:HA	2.46	0.51
1:B:523:LEU:HB2	1:B:640:THR:HG22	1.92	0.50
1:B:508:THR:HG22	1:B:590:ASP:HA	1.93	0.50
1:A:588:GLN:HB2	1:A:595:THR:HG22	1.92	0.50
1:B:395:THR:HG23	1:B:403:THR:CG2	2.42	0.50
1:B:329:ASP:N	1:B:329:ASP:OD1	2.45	0.49
1:A:523:LEU:HB2	1:A:640:THR:HG22	1.94	0.49
1:B:570:ILE:HD11	1:B:605:TYR:HB2	1.95	0.47
1:A:508:THR:CG2	1:A:590:ASP:OD1	2.62	0.47
1:B:650:CYS:O	1:B:651:ILE:HD12	2.14	0.47
1:A:508:THR:HG22	1:A:590:ASP:HA	1.96	0.47
1:B:279:LYS:CB	1:B:282:TYR:HE1	2.28	0.47
1:A:282:TYR:CD2	1:A:461:ARG:CA	2.92	0.46
1:A:650:CYS:O	1:A:651:ILE:HD12	2.15	0.46
1:A:614:LEU:HG	1:A:616:LEU:HG	1.97	0.46
1:A:282:TYR:CD1	1:A:282:TYR:N	2.83	0.46
1:A:491:PHE:CZ	1:A:498:ILE:HD12	2.50	0.46
1:A:637:GLU:OE2	1:A:637:GLU:N	2.43	0.46
1:A:402:LEU:HD13	1:B:355:VAL:CG1	2.45	0.46
1:B:349:GLY:HA3	1:B:409:GLN:HB2	1.98	0.46
1:A:570:ILE:HD11	1:A:605:TYR:HB2	1.98	0.45
1:B:374:ARG:NH2	1:B:376:LEU:O	2.49	0.45
1:B:283:ILE:HG23	1:B:446:LYS:HB3	1.99	0.45
1:B:309:THR:HG23	1:B:449:VAL:CG1	2.45	0.45
1:A:489:ILE:HD11	1:A:664:ARG:HA	1.99	0.45
1:B:373:THR:OG1	1:B:395:THR:HB	2.17	0.44
1:B:592:ARG:HG3	1:B:612:GLU:HA	1.98	0.44
1:A:282:TYR:N	1:A:282:TYR:HD1	2.15	0.44
1:A:589:ARG:HG3	1:A:605:TYR:OH	2.17	0.44
1:A:317:ARG:HD3	1:A:337:ASN:HA	2.00	0.43
1:A:491:PHE:HZ	1:A:498:ILE:HD12	1.83	0.43
1:A:348:SER:OG	1:A:412:TYR:HB2	2.18	0.43
1:A:399:ASP:HB2	1:A:401:ILE:HD12	1.99	0.43
1:A:489:ILE:HG13	1:A:663:ILE:HD11	1.99	0.43
1:B:395:THR:HG23	1:B:403:THR:HG22	2.01	0.43
1:A:523:LEU:HB2	1:A:640:THR:HG21	2.01	0.43
1:A:373:THR:OG1	1:A:395:THR:HB	2.19	0.42
1:B:500:LEU:CB	1:B:501:PRO:CD	2.97	0.42
1:A:519:GLU:HG3	1:A:648:VAL:HG22	2.01	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:351:PHE:CD1	1:B:351:PHE:C	2.92	0.42
1:B:493:THR:O	1:B:496:SER:OG	2.38	0.42
1:A:669:VAL:HG12	1:A:669:VAL:O	2.19	0.42
1:B:349:GLY:O	1:B:408:THR:CG2	2.67	0.42
1:A:323:HIS:HE1	1:A:433:PRO:O	2.03	0.42
1:B:349:GLY:O	1:B:408:THR:HG22	2.19	0.42
1:A:351:PHE:CD1	1:A:351:PHE:C	2.92	0.41
1:B:323:HIS:HE1	1:B:433:PRO:O	2.03	0.41
1:A:283:ILE:HG23	1:A:446:LYS:HB3	2.02	0.41
1:A:523:LEU:CA	1:A:640:THR:HG21	2.50	0.41
1:A:595:THR:OG1	1:A:602:ARG:CG	2.68	0.41
1:B:523:LEU:HB2	1:B:640:THR:HG21	2.03	0.41
1:A:605:TYR:CD1	1:A:605:TYR:C	2.94	0.41
1:A:647:TYR:CE2	1:A:651:ILE:HD13	2.55	0.41
1:A:500:LEU:CB	1:A:501:PRO:CD	2.98	0.41
1:B:472:ILE:HD13	1:B:472:ILE:HG21	1.82	0.41
1:B:605:TYR:CD1	1:B:605:TYR:C	2.94	0.41
1:A:358:VAL:HG21	1:B:400:GLY:HA2	2.03	0.41
1:B:489:ILE:HD12	1:B:663:ILE:HG21	2.03	0.40
1:B:523:LEU:CA	1:B:640:THR:HG21	2.52	0.40
1:B:589:ARG:HG3	1:B:605:TYR:OH	2.22	0.40
1:A:489:ILE:O	1:A:650:CYS:HA	2.21	0.40
1:A:517:THR:HB	1:A:647:TYR:OH	2.21	0.40
1:A:493:THR:O	1:A:496:SER:OG	2.39	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	378/402 (94%)	358 (95%)	20 (5%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	380/402 (94%)	365 (96%)	15 (4%)	0	100	100
All	All	758/804 (94%)	723 (95%)	35 (5%)	0	100	100

There are no Ramachandran outliers to report.

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	287/344 (83%)	275 (96%)	12 (4%)	30	54
1	B	297/344 (86%)	282 (95%)	15 (5%)	24	45
All	All	584/688 (85%)	557 (95%)	27 (5%)	27	51

All (27) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	305	SER
1	A	329	ASP
1	A	341	SER
1	A	395	THR
1	A	397	SER
1	A	421	PHE
1	A	442	MET
1	A	481	GLU
1	A	496	SER
1	A	573	LEU
1	A	651	ILE
1	A	672	THR
1	B	305	SER
1	B	329	ASP
1	B	341	SER
1	B	369	ASP
1	B	376	LEU
1	B	397	SER

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Mol	Chain	Res	Type
1	B	421	PHE
1	B	442	MET
1	B	496	SER
1	B	548	PHE
1	B	565	SER
1	B	617	ASP
1	B	636	THR
1	B	651	ILE
1	B	672	THR

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, 95^{th} 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	380/402 (94%)	-0.22	5 (1%)	77	74	32, 56, 86, 127	0
1	B	382/402 (95%)	-0.15	7 (1%)	68	63	26, 49, 87, 124	0
All	All	762/804 (94%)	-0.19	12 (1%)	72	68	26, 53, 87, 127	0

All (12) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	667	ALA	5.1
1	B	668	GLU	4.4
1	A	667	ALA	3.9
1	B	666	MET	3.4
1	A	664	ARG	3.1
1	B	669	VAL	2.7
1	A	666	MET	2.6
1	A	455	VAL	2.5
1	B	536	ASP	2.4
1	A	668	GLU	2.3
1	B	673	ALA	2.1
1	B	420	PHE	2.1

6.2 Non-standard residues in protein, DNA, RNA chains

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates

There are no monosaccharides in this entry.

6.4 Ligands

There are no ligands in this entry.

6.5 Other polymers

There are no such residues in this entry.