



Full wwPDB X-ray Structure Validation Report ⓘ

May 28, 2020 – 08:01 pm BST

PDB ID : 1NCJ
Title : N-CADHERIN, TWO-DOMAIN FRAGMENT
Authors : Tamura, K.; Shan, W.-S.; Hendrickson, W.A.; Colman, D.R.; Shapiro, L.
Deposited on : 1999-02-02
Resolution : 3.40 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Xtriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.11

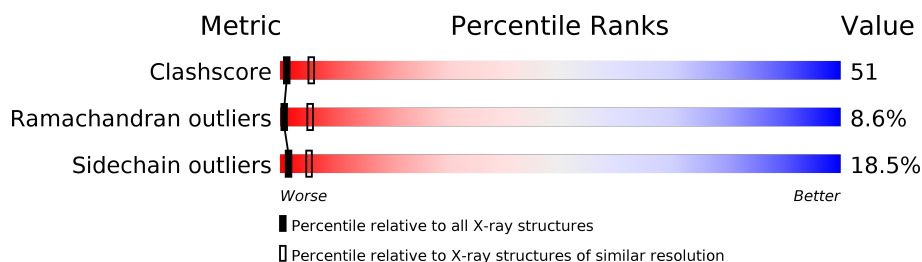
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.40 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))
Clashscore	141614	1055 (3.48-3.32)
Ramachandran outliers	138981	1038 (3.48-3.32)
Sidechain outliers	138945	1038 (3.48-3.32)

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 ≥ 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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	215	

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 1855 atoms, of which 313 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 (N-CADHERIN).

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	214	Total	C	H	N	O	S	320	0	0
			1851	968	313	261	304	5			

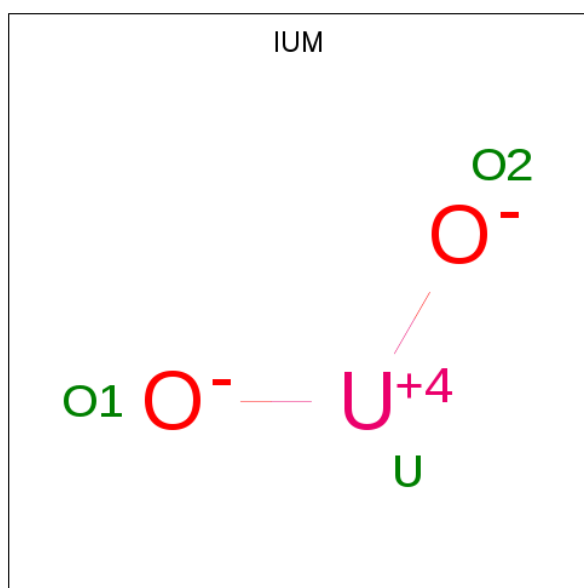
There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	150	VAL	LEU	CONFLICT	UNP P15116

- Molecule 2 is CALCIUM ION (three-letter code: CA) (formula: Ca).

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

- Molecule 3 is URANYL (VI) ION (three-letter code: IUM) (formula: O₂U).



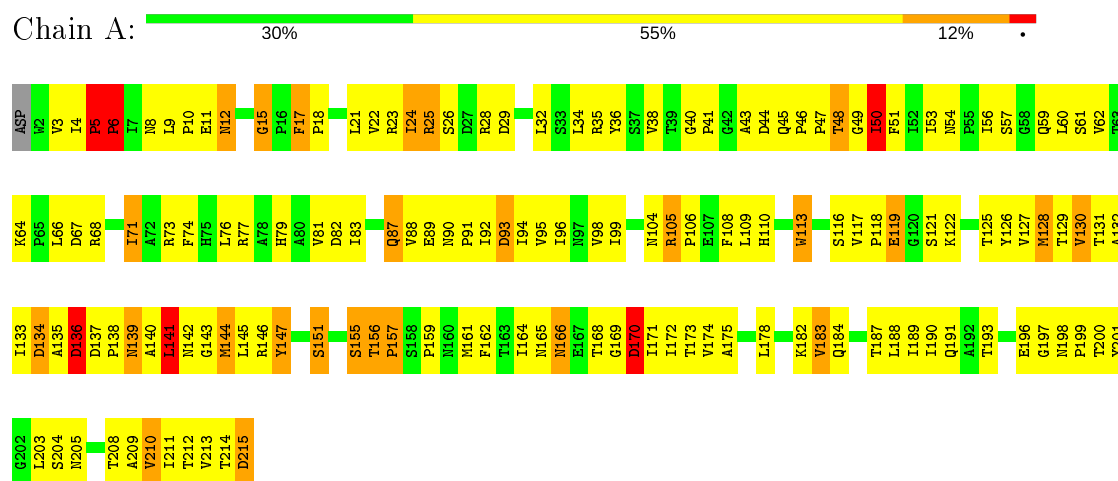
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	U	0	0
			1	1		

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 the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. 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. 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.

Note EDS was not executed.

• Molecule 1: PROTEIN (N-CADHERIN)



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	I 4 2 2	Depositor
Cell constants a, b, c, α , β , γ	99.00 Å 99.00 Å 136.10 Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	6.00 – 3.40	Depositor
% Data completeness (in resolution range)	97.4 (6.00-3.40)	Depositor
R_{merge}	0.93	Depositor
R_{sym}	0.93	Depositor
Refinement program	X-PLOR 3.1	Depositor
R, R_{free}	0.212 , 0.321	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	1855	wwPDB-VP
Average B, all atoms (Å ²)	24.0	wwPDB-VP

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: CA, IUM

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	0.57	0/1569	0.93	4/2160 (0.2%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	215	ASP	CB-CG-OD2	5.58	123.32	118.30
1	A	141	LEU	N-CA-C	-5.42	96.38	111.00
1	A	215	ASP	CB-CG-OD1	5.29	123.06	118.30
1	A	215	ASP	OD1-CG-OD2	-5.14	113.54	123.30

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	1538	313	1434	146	0
2	A	3	0	0	0	0
3	A	1	0	0	0	0
All	All	1542	313	1434	146	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 51.

All (146) 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:9:LEU:HD22	1:A:66:LEU:HD12	1.43	0.98
1:A:193:THR:HG22	1:A:204:SER:HB3	1.48	0.92
1:A:87:GLN:HE22	1:A:91:PRO:HD3	1.35	0.90
1:A:141:LEU:HA	1:A:144:MET:HG3	1.56	0.85
1:A:117:VAL:HB	1:A:127:VAL:HG22	1.57	0.84
1:A:156:THR:HA	1:A:157:PRO:C	1.99	0.84
1:A:141:LEU:H	1:A:141:LEU:HD22	1.41	0.83
1:A:50:ILE:HG13	1:A:64:LYS:HE3	1.59	0.82
1:A:87:GLN:NE2	1:A:91:PRO:HD3	1.94	0.81
1:A:77:ARG:HA	1:A:92:ILE:O	1.81	0.81
1:A:108:PHE:HA	1:A:132:ALA:HA	1.62	0.80
1:A:34:LEU:HD21	1:A:88:VAL:HG21	1.64	0.79
1:A:9:LEU:HD11	1:A:62:VAL:HG21	1.65	0.78
1:A:118:PRO:HG2	1:A:121:SER:HB3	1.67	0.75
1:A:126:TYR:CD2	1:A:172:ILE:HD11	2.21	0.75
1:A:141:LEU:HA	1:A:144:MET:CG	2.19	0.73
1:A:51:PHE:CE1	1:A:96:ILE:HD13	2.24	0.72
1:A:105:ARG:HB3	1:A:205:ASN:ND2	2.07	0.69
1:A:9:LEU:HD22	1:A:66:LEU:CD1	2.21	0.68
1:A:66:LEU:HD13	1:A:98:VAL:HG22	1.73	0.68
1:A:11:GLU:HG3	1:A:67:ASP:HA	1.73	0.68
1:A:127:VAL:HG11	1:A:211:ILE:CG1	2.24	0.68
1:A:38:VAL:HG13	1:A:53:ILE:HB	1.77	0.67
1:A:119:GLU:O	1:A:178:LEU:HB2	1.95	0.67
1:A:193:THR:HG22	1:A:204:SER:CB	2.24	0.67
1:A:136:ASP:CG	1:A:143:GLY:HA3	2.15	0.67
1:A:54:ASN:ND2	1:A:57:SER:H	1.93	0.66
1:A:109:LEU:H	1:A:113:TRP:HH2	1.44	0.65
1:A:116:SER:HB2	1:A:212:THR:O	1.97	0.64
1:A:8:ASN:HB3	1:A:99:ILE:HG13	1.79	0.64
1:A:51:PHE:CZ	1:A:96:ILE:HG21	2.33	0.63
1:A:38:VAL:CG1	1:A:53:ILE:HB	2.30	0.62
1:A:23:ARG:HA	1:A:59:GLN:HA	1.81	0.62
1:A:164:ILE:HD11	1:A:190:ILE:HD13	1.81	0.61
1:A:108:PHE:CD1	1:A:132:ALA:HB2	2.36	0.60
1:A:171:ILE:O	1:A:172:ILE:HD12	2.01	0.60
1:A:17:PHE:HA	1:A:18:PRO:C	2.23	0.59
1:A:109:LEU:HD21	1:A:133:ILE:HD12	1.85	0.59
1:A:171:ILE:C	1:A:172:ILE:HD12	2.23	0.59
1:A:129:THR:HG23	1:A:170:ASP:N	2.17	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:127:VAL:HG12	1:A:128:MET:SD	2.44	0.58
1:A:146:ARG:HA	1:A:166:ASN:O	2.02	0.58
1:A:79:HIS:CD2	1:A:91:PRO:HB3	2.38	0.58
1:A:126:TYR:CE2	1:A:172:ILE:HD11	2.37	0.58
1:A:188:LEU:HB2	1:A:209:ALA:HB3	1.85	0.57
1:A:105:ARG:HB3	1:A:205:ASN:HD21	1.68	0.57
1:A:88:VAL:HG23	1:A:89:GLU:HG2	1.88	0.56
1:A:113:TRP:O	1:A:210:VAL:HG23	2.05	0.55
1:A:117:VAL:HB	1:A:127:VAL:CG2	2.32	0.55
1:A:117:VAL:CG2	1:A:118:PRO:HD2	2.37	0.55
1:A:137:ASP:O	1:A:139:ASN:N	2.40	0.55
1:A:9:LEU:CD1	1:A:62:VAL:HG21	2.36	0.55
1:A:136:ASP:CG	1:A:137:ASP:N	2.58	0.54
1:A:87:GLN:OE1	1:A:90:ASN:HA	2.07	0.54
1:A:134:ASP:HB2	1:A:145:LEU:HD21	1.88	0.54
1:A:73:ARG:HG2	1:A:74:PHE:N	2.23	0.54
1:A:51:PHE:CE1	1:A:62:VAL:HG22	2.44	0.53
1:A:41:PRO:HB3	1:A:46:PRO:O	2.09	0.52
1:A:156:THR:HA	1:A:157:PRO:O	2.09	0.52
1:A:15:GLY:N	1:A:17:PHE:CE1	2.77	0.52
1:A:87:GLN:HE22	1:A:91:PRO:CD	2.15	0.52
1:A:87:GLN:HG3	1:A:89:GLU:O	2.10	0.51
1:A:92:ILE:HD12	1:A:93:ASP:H	1.76	0.51
1:A:50:ILE:HG13	1:A:64:LYS:CE	2.38	0.50
1:A:130:VAL:HG11	1:A:190:ILE:HD12	1.93	0.50
1:A:170:ASP:OD1	1:A:170:ASP:N	2.45	0.50
1:A:198:ASN:HB3	1:A:201:TYR:HB2	1.94	0.50
1:A:105:ARG:CB	1:A:205:ASN:HD21	2.24	0.50
1:A:34:LEU:CD2	1:A:88:VAL:HG21	2.38	0.50
1:A:104:ASN:ND2	1:A:135:ALA:HB3	2.27	0.50
1:A:198:ASN:CB	1:A:201:TYR:HB2	2.42	0.50
1:A:110:HIS:O	1:A:113:TRP:CZ3	2.66	0.49
1:A:182:LYS:O	1:A:183:VAL:HG23	2.12	0.48
1:A:151:SER:HB2	1:A:189:ILE:HD13	1.94	0.48
1:A:134:ASP:CB	1:A:143:GLY:HA2	2.43	0.48
1:A:5:PRO:O	1:A:6:PRO:C	2.52	0.48
1:A:131:THR:HG22	1:A:147:TYR:OH	2.13	0.48
1:A:146:ARG:HH11	1:A:146:ARG:HG3	1.79	0.48
1:A:29:ASP:HA	1:A:32:LEU:O	2.14	0.48
1:A:47:PRO:HG2	1:A:50:ILE:HD13	1.95	0.48
1:A:46:PRO:HA	1:A:48:THR:N	2.29	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:49:GLY:O	1:A:50:ILE:HD12	2.14	0.47
1:A:35:ARG:O	1:A:81:VAL:HG12	2.15	0.47
1:A:132:ALA:C	1:A:133:ILE:HB	2.34	0.47
1:A:54:ASN:HD22	1:A:57:SER:H	1.61	0.47
1:A:108:PHE:HD1	1:A:131:THR:O	1.97	0.47
1:A:161:MET:HA	1:A:175:ALA:HB3	1.97	0.46
1:A:184:GLN:O	1:A:213:VAL:HG23	2.16	0.46
1:A:40:GLY:O	1:A:43:ALA:HB3	2.15	0.46
1:A:140:ALA:O	1:A:142:ASN:N	2.49	0.46
1:A:24:ILE:HB	1:A:53:ILE:HD11	1.98	0.46
1:A:36:TYR:HA	1:A:79:HIS:O	2.16	0.46
1:A:50:ILE:HG22	1:A:51:PHE:CD2	2.50	0.46
1:A:44:ASP:CG	1:A:45:GLN:N	2.70	0.45
1:A:22:VAL:O	1:A:60:LEU:HB2	2.17	0.45
1:A:118:PRO:HA	1:A:214:THR:OG1	2.17	0.45
1:A:113:TRP:N	1:A:208:THR:O	2.47	0.45
1:A:118:PRO:HG2	1:A:121:SER:CB	2.41	0.45
1:A:54:ASN:HD22	1:A:57:SER:N	2.14	0.45
1:A:60:LEU:HD22	1:A:94:ILE:HD13	1.99	0.45
1:A:140:ALA:O	1:A:144:MET:HG2	2.16	0.45
1:A:11:GLU:O	1:A:12:ASN:C	2.55	0.45
1:A:172:ILE:HG22	1:A:174:VAL:HG13	1.98	0.45
1:A:6:PRO:HG3	1:A:95:VAL:HB	1.99	0.45
1:A:191:GLN:HE21	1:A:193:THR:CG2	2.30	0.44
1:A:141:LEU:H	1:A:141:LEU:CD2	2.22	0.44
1:A:162:PHE:CD2	1:A:173:THR:HG22	2.52	0.44
1:A:190:ILE:HD12	1:A:209:ALA:HB2	1.99	0.44
1:A:155:SER:HB2	1:A:159:PRO:HD3	1.98	0.44
1:A:76:LEU:O	1:A:94:ILE:N	2.50	0.44
1:A:51:PHE:CD1	1:A:96:ILE:HD13	2.53	0.44
1:A:46:PRO:HA	1:A:47:PRO:C	2.36	0.43
1:A:198:ASN:HA	1:A:199:PRO:HD2	1.89	0.43
1:A:68:ARG:HA	1:A:71:ILE:O	2.18	0.43
1:A:141:LEU:HD12	1:A:196:GLU:HG3	1.99	0.43
1:A:104:ASN:HD21	1:A:135:ALA:HB3	1.82	0.43
1:A:108:PHE:HB3	1:A:113:TRP:HZ3	1.83	0.43
1:A:193:THR:OG1	1:A:197:GLY:HA2	2.19	0.43
1:A:118:PRO:O	1:A:119:GLU:C	2.57	0.43
1:A:122:LYS:O	1:A:125:THR:OG1	2.35	0.43
1:A:168:THR:OG1	1:A:169:GLY:N	2.52	0.42
1:A:125:THR:O	1:A:172:ILE:HA	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:92:ILE:HD12	1:A:93:ASP:N	2.34	0.42
1:A:144:MET:HG2	1:A:144:MET:H	1.64	0.42
1:A:10:PRO:HA	1:A:99:ILE:O	2.19	0.42
1:A:4:ILE:HD13	1:A:22:VAL:HG21	2.02	0.42
1:A:127:VAL:HG12	1:A:128:MET:N	2.35	0.42
1:A:25:ARG:NH2	1:A:26:SER:O	2.53	0.42
1:A:9:LEU:HD23	1:A:10:PRO:O	2.20	0.42
1:A:51:PHE:HE1	1:A:62:VAL:HG22	1.83	0.41
1:A:21:LEU:HD21	1:A:62:VAL:HG23	2.02	0.41
1:A:116:SER:CB	1:A:212:THR:O	2.68	0.41
1:A:68:ARG:HD2	1:A:98:VAL:O	2.21	0.41
1:A:108:PHE:CE1	1:A:132:ALA:HB2	2.55	0.41
1:A:164:ILE:HG21	1:A:164:ILE:HD13	1.68	0.41
1:A:18:PRO:HA	1:A:62:VAL:O	2.20	0.41
1:A:34:LEU:HD23	1:A:34:LEU:HA	1.88	0.41
1:A:51:PHE:CZ	1:A:66:LEU:HD21	2.56	0.41
1:A:87:GLN:OE1	1:A:90:ASN:ND2	2.54	0.41
1:A:81:VAL:HG22	1:A:82:ASP:O	2.21	0.41
1:A:41:PRO:HA	1:A:45:GLN:O	2.21	0.41
1:A:15:GLY:HA3	1:A:17:PHE:N	2.35	0.41
1:A:9:LEU:O	1:A:98:VAL:HA	2.20	0.41
1:A:81:VAL:HG22	1:A:82:ASP:N	2.36	0.40
1:A:117:VAL:HG22	1:A:118:PRO:HD2	2.03	0.40
1:A:106:PRO:HB3	1:A:145:LEU:HD22	2.03	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	210/215 (98%)	161 (77%)	31 (15%)	18 (9%)	1 5

All (18) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	3	VAL
1	A	6	PRO
1	A	119	GLU
1	A	136	ASP
1	A	138	PRO
1	A	139	ASN
1	A	157	PRO
1	A	200	THR
1	A	12	ASN
1	A	15	GLY
1	A	48	THR
1	A	50	ILE
1	A	5	PRO
1	A	166	ASN
1	A	170	ASP
1	A	183	VAL
1	A	24	ILE
1	A	56	ILE

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	157/188 (84%)	128 (82%)	29 (18%)	1 5

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	5	PRO
1	A	6	PRO
1	A	17	PHE
1	A	25	ARG
1	A	28	ARG
1	A	50	ILE
1	A	61	SER

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Mol	Chain	Res	Type
1	A	71	ILE
1	A	83	ILE
1	A	87	GLN
1	A	93	ASP
1	A	105	ARG
1	A	113	TRP
1	A	128	MET
1	A	130	VAL
1	A	134	ASP
1	A	136	ASP
1	A	141	LEU
1	A	144	MET
1	A	147	TYR
1	A	151	SER
1	A	155	SER
1	A	156	THR
1	A	165	ASN
1	A	170	ASP
1	A	187	THR
1	A	203	LEU
1	A	210	VAL
1	A	215	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	54	ASN
1	A	79	HIS
1	A	87	GLN
1	A	90	ASN
1	A	160	ASN
1	A	191	GLN
1	A	205	ASN

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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

Of 4 ligands modelled in this entry, 3 are monoatomic and 1 is modelled with single atom - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.