Full wwPDB X-ray Structure Validation Report ⓘ

Oct 23, 2021 – 02:16 PM EDT

PDB ID	:	1CUN
Title	:	CRYSTAL STRUCTURE OF REPEATS 16 AND 17 OF CHICKEN BRAIN ALPHA SPECTRIN
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Deposited on	:	1999-08-20
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 ⓘ symbol.

The following versions of software and data (see references ⓘ) were used in the production of this report:

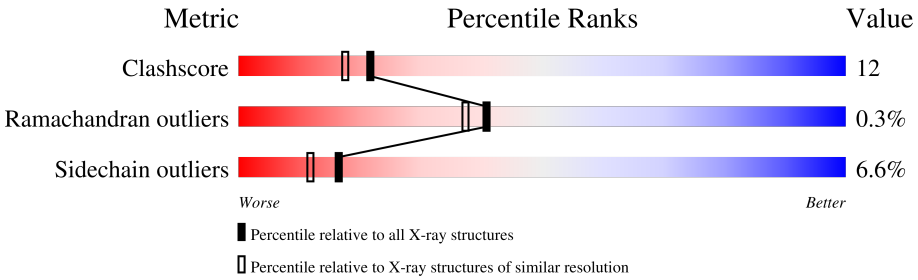
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.23.2

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))
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (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%

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	213	76% 20% .
1	B	213	78% 19% .
1	C	213	77% 20% .

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 5824 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 (ALPHA SPECTRIN).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	213	Total	C	N	O	S	0	0	0
			1712	1062	305	340	5			
1	B	213	Total	C	N	O	S	0	0	0
			1712	1062	305	340	5			
1	C	213	Total	C	N	O	S	0	0	0
			1712	1062	305	340	5			

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	7	MET	-	engineered mutation	UNP P07751
A	8	VAL	LEU	engineered mutation	UNP P07751
A	64	SER	GLY	engineered mutation	UNP P07751
B	7	MET	-	engineered mutation	UNP P07751
B	8	VAL	LEU	engineered mutation	UNP P07751
B	64	SER	GLY	engineered mutation	UNP P07751
C	7	MET	-	engineered mutation	UNP P07751
C	8	VAL	LEU	engineered mutation	UNP P07751
C	64	SER	GLY	engineered mutation	UNP P07751

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	240	Total	O	0	0
			240	240		
2	B	239	Total	O	0	0
			239	239		
2	C	209	Total	O	0	0
			209	209		

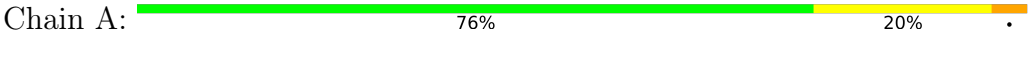
3 Residue-property plots (i)

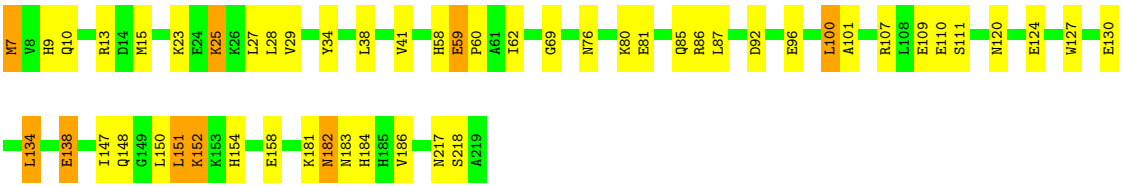
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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 (ALPHA SPECTRIN)

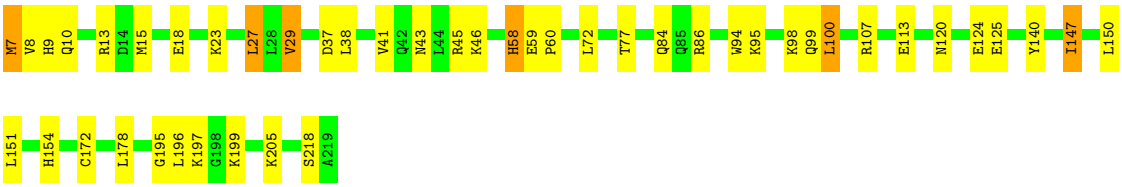
Chain A:





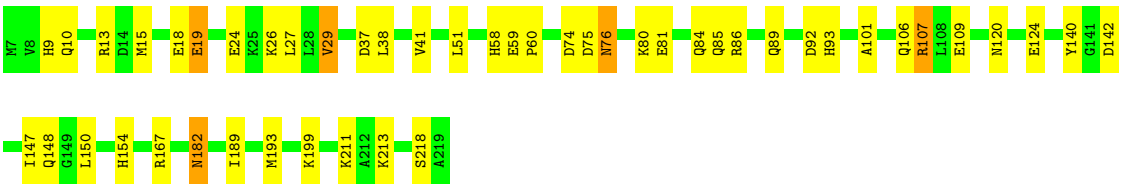
- Molecule 1: PROTEIN (ALPHA SPECTRIN)

Chain B:



- Molecule 1: PROTEIN (ALPHA SPECTRIN)

Chain C:



4 Data and refinement statistics (i)

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

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α, β, γ	126.34Å 201.15Å 94.77Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	24.63 – 2.00	Depositor
% Data completeness (in resolution range)	92.4 (24.63-2.00)	Depositor
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR, REFMAC	Depositor
R, R_{free}	0.220 , 0.257	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	5824	wwPDB-VP
Average B, all atoms (Å^2)	38.0	wwPDB-VP

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	0.47	0/1735	0.53	0/2325
1	B	0.47	0/1735	0.55	0/2325
1	C	0.43	0/1735	0.54	0/2325
All	All	0.46	0/5205	0.54	0/6975

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	1712	0	1689	48	0
1	B	1712	0	1689	38	0
1	C	1712	0	1689	47	0
2	A	240	0	0	6	0
2	B	239	0	0	8	0
2	C	209	0	0	9	3
All	All	5824	0	5067	121	3

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 12.

All (121) 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:182:ASN:C	1:A:182:ASN:HD22	1.80	0.85
1:B:72:LEU:O	1:B:77:THR:HG23	1.86	0.76
1:C:15:MET:HE3	1:C:86:ARG:HB3	1.69	0.76
1:A:148:GLN:O	1:A:152:LYS:HD2	1.88	0.73
1:A:110:GLU:HG3	1:A:181:LYS:CE	2.20	0.71
1:B:18:GLU:OE1	1:B:58:HIS:HE1	1.74	0.71
1:A:147:ILE:HG21	1:A:218:SER:HB3	1.73	0.69
1:B:9:HIS:HE1	1:C:124:GLU:OE2	1.76	0.69
1:B:13:ARG:HH12	1:C:120:ASN:HD21	1.41	0.69
1:C:15:MET:CE	1:C:86:ARG:HB3	2.23	0.68
1:A:138:GLU:H	1:A:138:GLU:CD	1.97	0.68
1:A:92:ASP:HB2	2:A:337:HOH:O	1.95	0.65
1:A:110:GLU:HG3	1:A:181:LYS:HE3	1.79	0.65
1:A:29:VAL:HG11	1:A:101:ALA:HA	1.79	0.65
1:A:182:ASN:C	1:A:182:ASN:ND2	2.51	0.64
1:A:10:GLN:NE2	1:A:13:ARG:HH11	1.96	0.63
1:C:29:VAL:HG21	1:C:101:ALA:HA	1.80	0.63
1:A:7:MET:N	2:A:234:HOH:O	2.32	0.62
1:A:23:LYS:O	1:A:27:LEU:HD23	1.99	0.62
1:C:10:GLN:NE2	1:C:13:ARG:HH11	1.98	0.62
1:B:100:LEU:HG	2:B:447:HOH:O	1.98	0.62
1:C:74:ASP:C	1:C:76:ASN:H	2.03	0.61
1:A:13:ARG:HH22	1:B:120:ASN:ND2	1.97	0.61
1:A:25:LYS:HE2	1:A:28:LEU:HD12	1.81	0.60
1:C:154:HIS:HE1	2:C:223:HOH:O	1.84	0.59
1:A:9:HIS:HE1	1:B:124:GLU:OE2	1.85	0.59
1:A:183:ASN:O	1:A:186:VAL:HG23	2.03	0.59
1:B:23:LYS:O	1:B:27:LEU:HD13	2.03	0.57
1:B:13:ARG:HH22	1:C:120:ASN:ND2	2.02	0.57
1:C:18:GLU:OE1	1:C:58:HIS:HE1	1.87	0.57
1:A:110:GLU:HG3	1:A:181:LYS:HE2	1.87	0.57
1:A:120:ASN:HD21	1:C:13:ARG:HH12	1.53	0.56
1:B:10:GLN:NE2	1:B:13:ARG:HH11	2.04	0.56
1:A:111:SER:HA	2:A:418:HOH:O	2.04	0.56
1:A:59:GLU:N	1:A:60:PRO:HD2	2.20	0.56
1:A:29:VAL:HG12	1:A:29:VAL:O	2.06	0.56
1:A:69:GLY:HA3	1:A:87:LEU:HD11	1.88	0.55
1:A:183:ASN:C	1:A:186:VAL:HG23	2.27	0.54
1:A:124:GLU:OE2	1:C:9:HIS:HE1	1.90	0.54
1:A:154:HIS:HE1	1:A:158:GLU:OE2	1.91	0.54
1:A:58:HIS:O	1:A:62:ILE:HG12	2.07	0.54
1:A:34:TYR:O	1:A:41:VAL:HG22	2.09	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:154:HIS:HE1	2:B:252:HOH:O	1.90	0.53
1:A:182:ASN:ND2	1:A:184:HIS:H	2.07	0.52
1:B:9:HIS:HD2	2:B:256:HOH:O	1.93	0.52
1:C:140:TYR:CZ	1:C:213:LYS:HG2	2.44	0.52
1:C:167:ARG:HH11	1:C:167:ARG:HG3	1.75	0.51
1:B:59:GLU:HB3	2:B:364:HOH:O	2.10	0.51
1:B:154:HIS:HD2	2:B:235:HOH:O	1.94	0.51
1:B:147:ILE:O	1:B:151:LEU:HD13	2.10	0.51
1:C:167:ARG:NE	2:C:224:HOH:O	2.30	0.50
1:A:29:VAL:HG11	1:A:101:ALA:CA	2.42	0.50
1:A:96:GLU:HG2	1:A:100:LEU:HD22	1.94	0.50
1:A:181:LYS:O	1:A:182:ASN:HB3	2.12	0.50
1:B:7:MET:N	2:B:220:HOH:O	2.45	0.50
1:C:107:ARG:HA	1:C:107:ARG:HE	1.76	0.50
1:B:140:TYR:O	1:B:147:ILE:HG12	2.12	0.49
1:A:147:ILE:HG22	1:A:151:LEU:HD22	1.94	0.49
1:B:59:GLU:HB2	1:B:60:PRO:HD3	1.94	0.49
1:C:26:LYS:O	1:C:29:VAL:HG12	2.12	0.49
1:B:9:HIS:CE1	1:C:124:GLU:OE2	2.63	0.49
1:B:147:ILE:HD12	1:B:218:SER:HB3	1.93	0.49
1:B:147:ILE:HD13	1:B:151:LEU:HD13	1.93	0.49
1:C:211:LYS:HG2	2:C:320:HOH:O	2.11	0.49
1:C:167:ARG:NH1	2:C:277:HOH:O	2.46	0.49
1:B:113:GLU:HB3	1:B:178:LEU:HD21	1.95	0.48
1:A:183:ASN:HA	1:A:186:VAL:CG2	2.43	0.48
1:C:107:ARG:HE	1:C:107:ARG:CA	2.27	0.48
1:A:15:MET:HE3	1:A:86:ARG:HB3	1.94	0.48
1:A:76:ASN:ND2	1:A:80:LYS:NZ	2.61	0.48
1:B:15:MET:CE	1:B:86:ARG:HB3	2.44	0.48
1:C:29:VAL:CG2	1:C:101:ALA:HA	2.44	0.47
1:C:80:LYS:O	1:C:84:GLN:HG3	2.14	0.47
1:C:74:ASP:C	1:C:76:ASN:N	2.68	0.47
1:B:77:THR:HA	2:C:427:HOH:O	2.14	0.47
1:C:167:ARG:HG3	1:C:167:ARG:NH1	2.30	0.46
1:A:120:ASN:ND2	1:C:13:ARG:HH22	2.13	0.46
1:C:9:HIS:HD2	2:C:251:HOH:O	1.97	0.46
1:C:74:ASP:O	1:C:76:ASN:N	2.49	0.46
1:C:18:GLU:OE1	1:C:18:GLU:HA	2.16	0.45
1:C:182:ASN:N	1:C:182:ASN:HD22	2.14	0.45
1:A:29:VAL:CG1	1:A:101:ALA:HA	2.45	0.45
1:C:37:ASP:O	1:C:41:VAL:HG23	2.15	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:13:ARG:HH12	1:B:120:ASN:HD21	1.63	0.45
1:A:134:LEU:HD13	2:A:404:HOH:O	2.18	0.44
1:B:29:VAL:CG1	1:B:100:LEU:HB3	2.48	0.44
1:B:95:LYS:O	1:B:99:GLN:HG3	2.17	0.44
1:B:172:CYS:SG	1:B:197:LYS:HE3	2.58	0.44
1:C:59:GLU:N	1:C:60:PRO:CD	2.80	0.44
1:C:18:GLU:OE1	1:C:58:HIS:CE1	2.70	0.44
1:C:19:GLU:HG3	2:C:292:HOH:O	2.18	0.44
1:C:51:LEU:C	1:C:51:LEU:HD23	2.39	0.44
1:A:127:TRP:O	1:A:130:GLU:HG2	2.18	0.43
1:C:154:HIS:HD2	2:C:236:HOH:O	2.01	0.43
1:C:189:ILE:O	1:C:193:MET:HG3	2.18	0.43
1:A:9:HIS:HD2	2:A:225:HOH:O	2.01	0.43
1:A:154:HIS:HD2	2:A:224:HOH:O	2.01	0.43
1:A:9:HIS:CE1	1:B:124:GLU:OE2	2.70	0.42
1:C:76:ASN:ND2	1:C:80:LYS:HE3	2.34	0.42
1:A:154:HIS:CE1	1:A:158:GLU:OE2	2.72	0.42
1:B:37:ASP:O	1:B:41:VAL:HG23	2.20	0.42
1:B:45:ARG:HD3	2:B:286:HOH:O	2.20	0.42
1:A:76:ASN:ND2	1:A:80:LYS:HZ2	2.18	0.42
1:B:13:ARG:HH22	1:C:120:ASN:HD22	1.68	0.42
1:B:94:TRP:CE2	1:B:98:LYS:HD2	2.55	0.41
1:A:181:LYS:NZ	1:A:182:ASN:ND2	2.69	0.41
1:C:19:GLU:OE1	1:C:93:HIS:ND1	2.47	0.41
1:C:147:ILE:HG12	1:C:218:SER:HB3	2.02	0.41
1:C:147:ILE:HG23	1:C:148:GLN:N	2.36	0.41
1:B:29:VAL:O	1:B:29:VAL:HG13	2.20	0.41
1:C:15:MET:HE3	1:C:86:ARG:CZ	2.50	0.41
1:B:84:GLN:HG2	2:B:309:HOH:O	2.20	0.41
1:B:125:GLU:HG2	1:B:196:LEU:HD13	2.03	0.41
1:B:43:ASN:HA	1:B:46:LYS:HE2	2.03	0.40
1:C:10:GLN:HE21	1:C:13:ARG:HH11	1.67	0.40
1:A:148:GLN:O	1:A:152:LYS:CD	2.65	0.40
1:C:24:GLU:O	1:C:27:LEU:HB3	2.21	0.40
1:C:199:LYS:NZ	2:C:415:HOH:O	2.54	0.40
1:B:195:GLY:O	1:B:199:LYS:HG3	2.21	0.40
1:C:81:GLU:HG2	1:C:85:GLN:HE21	1.87	0.40
1:A:81:GLU:O	1:A:85:GLN:HG3	2.22	0.40

All (3) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:405:HOH:O	2:C:405:HOH:O[3_656]	1.68	0.52
2:C:341:HOH:O	2:C:341:HOH:O[3_656]	1.80	0.40
2:C:417:HOH:O	2:C:417:HOH:O[3_656]	2.07	0.13

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	211/213 (99%)	210 (100%)	1 (0%)	0	100 100
1	B	211/213 (99%)	208 (99%)	3 (1%)	0	100 100
1	C	211/213 (99%)	207 (98%)	2 (1%)	2 (1%)	17 11
All	All	633/639 (99%)	625 (99%)	6 (1%)	2 (0%)	41 37

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	75	ASP
1	C	76	ASN

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	182/182 (100%)	168 (92%)	14 (8%)	13 8
1	B	182/182 (100%)	171 (94%)	11 (6%)	19 14
1	C	182/182 (100%)	171 (94%)	11 (6%)	19 14

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	546/546 (100%)	510 (93%)	36 (7%)	16 12

All (36) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	7	MET
1	A	25	LYS
1	A	38	LEU
1	A	59	GLU
1	A	100	LEU
1	A	107	ARG
1	A	109	GLU
1	A	134	LEU
1	A	138	GLU
1	A	150	LEU
1	A	151	LEU
1	A	152	LYS
1	A	182	ASN
1	A	217	ASN
1	B	7	MET
1	B	8	VAL
1	B	27	LEU
1	B	29	VAL
1	B	38	LEU
1	B	58	HIS
1	B	100	LEU
1	B	107	ARG
1	B	147	ILE
1	B	150	LEU
1	B	205	LYS
1	C	19	GLU
1	C	29	VAL
1	C	38	LEU
1	C	89	GLN
1	C	92	ASP
1	C	106	GLN
1	C	107	ARG
1	C	109	GLU
1	C	142	ASP
1	C	150	LEU
1	C	182	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (35) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	9	HIS
1	A	10	GLN
1	A	42	GLN
1	A	76	ASN
1	A	99	GLN
1	A	115	GLN
1	A	120	ASN
1	A	148	GLN
1	A	154	HIS
1	A	182	ASN
1	A	183	ASN
1	A	188	ASN
1	A	209	GLN
1	B	9	HIS
1	B	10	GLN
1	B	58	HIS
1	B	84	GLN
1	B	120	ASN
1	B	148	GLN
1	B	154	HIS
1	B	188	ASN
1	B	209	GLN
1	C	9	HIS
1	C	10	GLN
1	C	76	ASN
1	C	84	GLN
1	C	85	GLN
1	C	99	GLN
1	C	106	GLN
1	C	120	ASN
1	C	148	GLN
1	C	154	HIS
1	C	188	ASN
1	C	209	GLN
1	C	217	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 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

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.