



# Full wwPDB X-ray Structure Validation Report

Feb 27, 2014 – 03:56 PM GMT

PDB ID : 1C3P  
Title : CRYSTAL STRUCTURE OF AN HDAC HOMOLOG FROM AQUIFEX AEOLICUS  
Authors : Finnin, M.S.; Donigian, J.R.; Pavletich, N.P.  
Deposited on : 1999-07-28  
Resolution : 1.80 Å(reported)

This is a full wwPDB validation report for a publicly released PDB entry.  
We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)  
A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

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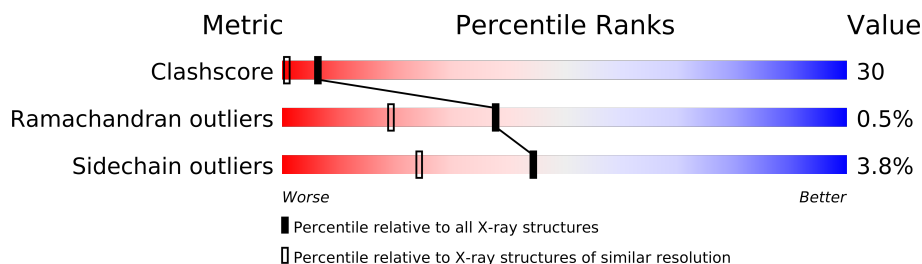
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.15 2013  
Xtriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 21963  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)  
Validation Pipeline (wwPDB-VP) : stable22683

# 1 Overall quality at a glance

The reported resolution of this entry is 1.80 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	79885	4461 (1.80-1.80)
Ramachandran outliers	78287	4404 (1.80-1.80)
Sidechain outliers	78261	4403 (1.80-1.80)

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  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	375	

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3213 atoms, of which 0 are hydrogen and 0 are deuterium.

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 (HDLP (HISTONE DEACETYLASE-LIKE PROTEIN)).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	372	Total	C	N	O	S	0	0	0
			2985	1927	493	555	10			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	35	LYS	LEU	CONFLICT	UNP O67135
A	146	ASN	ASP	CONFLICT	UNP O67135

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	228	Total	O	0	0
			228	228		

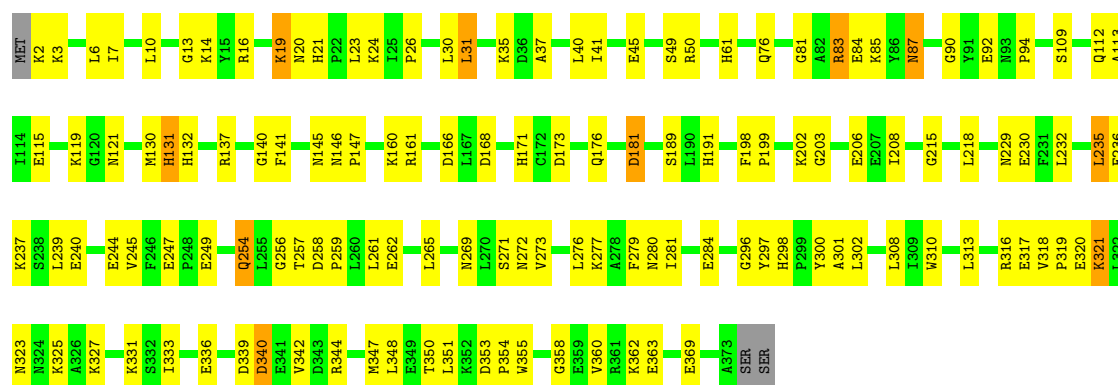
### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

Note EDS was not executed.

- Molecule 1: PROTEIN (HDLP (HISTONE DEACETYLASE-LIKE PROTEIN))

Chain A: 



## 4 Data and refinement statistics

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

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	51.40Å 93.80Å 78.70Å 90.00° 96.90° 90.00°	Depositor
Resolution (Å)	20.00 – 1.80	Depositor
% Data completeness (in resolution range)	(Not available) (20.00-1.80)	Depositor
$R_{merge}$	0.03	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	CNS	Depositor
R, $R_{free}$	0.198 , 0.240	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3213	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	27.0	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	0.45	0/3056	0.73	1/4124 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	296	GLY	N-CA-C	-5.52	99.30	113.10

There are no chirality outliers.

There are no planarity outliers.

### 5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2985	0	2949	179	1
2	A	228	0	0	29	0
All	All	3213	0	2949	179	1

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 30.

All (179) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:272:ASN:HB2	2:A:601:HOH:O	1.32	1.21

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:321:LYS:H	1:A:321:LYS:HD3	1.14	1.12
1:A:3:LYS:H	1:A:121:ASN:ND2	1.64	0.95
1:A:30:LEU:HG	2:A:538:HOH:O	1.66	0.93
1:A:344:ARG:HB3	1:A:347:MET:CE	1.99	0.92
1:A:130:MET:H	1:A:146:ASN:HD21	1.20	0.89
1:A:344:ARG:HB3	1:A:347:MET:HE1	1.52	0.88
1:A:347:MET:SD	2:A:535:HOH:O	2.31	0.88
1:A:168:ASP:HB2	1:A:254:GLN:NE2	1.88	0.88
1:A:321:LYS:HD3	1:A:321:LYS:N	1.87	0.88
1:A:208:ILE:HB	2:A:585:HOH:O	1.76	0.84
1:A:363:GLU:HG3	2:A:394:HOH:O	1.78	0.83
1:A:229:ASN:HD22	1:A:358:GLY:H	1.23	0.83
1:A:35:LYS:HB2	1:A:35:LYS:NZ	1.94	0.81
1:A:300:TYR:CD2	1:A:347:MET:HE3	2.17	0.79
1:A:131:HIS:HD2	1:A:166:ASP:OD2	1.68	0.77
1:A:21:HIS:HD2	1:A:23:LEU:H	1.30	0.76
1:A:31:LEU:HD22	1:A:35:LYS:HE3	1.69	0.74
1:A:19:LYS:HG3	1:A:20:ASN:H	1.53	0.73
1:A:3:LYS:HB2	1:A:121:ASN:HD22	1.54	0.72
1:A:61:HIS:HE1	1:A:145:ASN:H	1.36	0.72
1:A:76:GLN:OE1	2:A:527:HOH:O	2.08	0.71
1:A:19:LYS:HG3	1:A:20:ASN:N	2.06	0.70
1:A:208:ILE:O	1:A:208:ILE:HG22	1.93	0.69
1:A:19:LYS:CG	1:A:20:ASN:H	2.02	0.69
1:A:35:LYS:HB2	1:A:35:LYS:HZ2	1.57	0.68
1:A:61:HIS:CE1	1:A:145:ASN:H	2.11	0.68
1:A:3:LYS:HB2	1:A:121:ASN:ND2	2.09	0.68
1:A:130:MET:H	1:A:146:ASN:ND2	1.91	0.68
1:A:298:HIS:HD2	1:A:301:ALA:H	1.42	0.68
1:A:49:SER:HA	1:A:112:GLN:HE22	1.58	0.67
1:A:206:GLU:H	1:A:206:GLU:CD	1.97	0.66
1:A:130:MET:HE2	2:A:531:HOH:O	1.96	0.66
1:A:254:GLN:NE2	1:A:256:GLY:H	1.94	0.65
1:A:41:ILE:HD12	1:A:45:GLU:OE1	1.96	0.65
1:A:84:GLU:HB2	2:A:467:HOH:O	1.96	0.65
1:A:300:TYR:HD2	1:A:347:MET:HE3	1.61	0.65
1:A:130:MET:CE	2:A:531:HOH:O	2.43	0.65
1:A:3:LYS:H	1:A:121:ASN:HD22	1.41	0.65
1:A:277:LYS:HD3	1:A:355:TRP:HH2	1.62	0.65
1:A:208:ILE:HD11	2:A:537:HOH:O	1.96	0.65
1:A:3:LYS:N	1:A:121:ASN:ND2	2.43	0.64
1:A:30:LEU:O	1:A:30:LEU:HD13	1.97	0.64

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:40:LEU:HA	1:A:316:ARG:NH1	2.11	0.64
1:A:257:THR:C	1:A:259:PRO:HD2	2.19	0.63
1:A:202:LYS:HD2	2:A:453:HOH:O	1.98	0.63
1:A:362:LYS:H	1:A:362:LYS:CE	2.11	0.63
1:A:6:LEU:HD23	1:A:7:ILE:N	2.14	0.62
1:A:344:ARG:HB3	1:A:347:MET:HE2	1.81	0.62
1:A:83:ARG:HH21	1:A:90:GLY:HA3	1.64	0.62
1:A:308:LEU:HD21	1:A:351:LEU:HD22	1.83	0.61
1:A:362:LYS:H	1:A:362:LYS:HE2	1.66	0.61
1:A:3:LYS:CB	1:A:121:ASN:HD22	2.14	0.60
1:A:321:LYS:CD	1:A:321:LYS:N	2.64	0.60
1:A:19:LYS:HE2	2:A:526:HOH:O	2.01	0.60
1:A:277:LYS:HD3	1:A:355:TRP:CH2	2.36	0.60
1:A:30:LEU:HD13	1:A:30:LEU:C	2.23	0.60
1:A:3:LYS:N	1:A:121:ASN:HD22	1.98	0.59
1:A:229:ASN:ND2	1:A:358:GLY:H	1.96	0.59
1:A:40:LEU:HA	1:A:316:ARG:HH11	1.66	0.58
1:A:137:ARG:HD2	2:A:556:HOH:O	2.02	0.58
1:A:41:ILE:HD13	1:A:310:TRP:CZ2	2.39	0.58
1:A:13:GLY:HA2	1:A:16:ARG:HE	1.67	0.58
1:A:265:LEU:HD12	1:A:297:TYR:CD1	2.39	0.58
1:A:35:LYS:CB	1:A:35:LYS:NZ	2.66	0.57
1:A:161:ARG:HB2	1:A:249:GLU:HG3	1.86	0.57
1:A:265:LEU:HD12	1:A:297:TYR:CG	2.39	0.57
1:A:279:PHE:HZ	1:A:313:LEU:HD21	1.69	0.57
1:A:240:GLU:O	1:A:244:GLU:HG3	2.05	0.57
1:A:258:ASP:N	1:A:259:PRO:HD2	2.20	0.57
1:A:320:GLU:O	1:A:350:THR:HG23	2.05	0.56
1:A:121:ASN:CG	2:A:426:HOH:O	2.43	0.56
1:A:300:TYR:HD2	1:A:347:MET:CE	2.18	0.56
1:A:189:SER:OG	1:A:191:HIS:HD2	1.88	0.56
1:A:280:ASN:O	1:A:284:GLU:HG3	2.05	0.56
1:A:109:SER:HA	1:A:112:GLN:HE21	1.71	0.56
1:A:16:ARG:HD3	2:A:476:HOH:O	2.06	0.56
1:A:16:ARG:HG3	1:A:16:ARG:HH11	1.71	0.55
1:A:76:GLN:OE1	1:A:76:GLN:HA	2.06	0.55
1:A:2:LYS:N	2:A:530:HOH:O	2.39	0.55
1:A:272:ASN:ND2	2:A:525:HOH:O	2.39	0.55
1:A:83:ARG:NH2	1:A:90:GLY:HA3	2.22	0.55
1:A:276:LEU:HD23	1:A:276:LEU:O	2.06	0.54
1:A:19:LYS:O	1:A:24:LYS:HE2	2.08	0.54
1:A:344:ARG:CB	1:A:347:MET:HE1	2.31	0.54

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:262:GLU:HG2	1:A:347:MET:SD	2.47	0.54
1:A:81:GLY:O	1:A:84:GLU:HG2	2.06	0.54
1:A:327:LYS:O	1:A:331:LYS:HG3	2.08	0.53
1:A:202:LYS:HE3	2:A:479:HOH:O	2.07	0.53
1:A:208:ILE:HG23	2:A:444:HOH:O	2.08	0.52
1:A:344:ARG:O	1:A:347:MET:HE2	2.10	0.52
1:A:191:HIS:HE1	1:A:203:GLY:O	1.94	0.51
1:A:3:LYS:CA	1:A:121:ASN:HD22	2.23	0.51
1:A:300:TYR:CD2	1:A:347:MET:CE	2.90	0.51
1:A:21:HIS:CD2	1:A:23:LEU:H	2.19	0.51
1:A:237:LYS:HG3	2:A:440:HOH:O	2.11	0.51
1:A:30:LEU:HD21	1:A:333:ILE:HD11	1.93	0.50
1:A:132:HIS:HD2	1:A:173:ASP:OD2	1.95	0.50
1:A:327:LYS:NZ	1:A:348:LEU:O	2.44	0.50
1:A:339:ASP:HB3	1:A:342:VAL:HG23	1.93	0.50
1:A:300:TYR:CB	1:A:347:MET:HE3	2.41	0.50
1:A:271:SER:HB2	1:A:353:ASP:OD2	2.11	0.49
1:A:229:ASN:HD22	1:A:358:GLY:N	2.02	0.49
1:A:273:VAL:HG12	1:A:355:TRP:CZ2	2.47	0.49
1:A:16:ARG:NH1	1:A:16:ARG:HG3	2.25	0.49
1:A:10:LEU:HD23	2:A:542:HOH:O	2.10	0.49
1:A:132:HIS:HE1	2:A:589:HOH:O	1.95	0.49
1:A:323:ASN:HD21	1:A:325:LYS:HB3	1.77	0.49
1:A:6:LEU:CD1	1:A:35:LYS:HE2	2.43	0.49
1:A:41:ILE:HD11	1:A:45:GLU:HB2	1.95	0.49
1:A:230:GLU:HG2	1:A:360:VAL:HA	1.94	0.48
1:A:3:LYS:CB	1:A:121:ASN:ND2	2.74	0.48
1:A:16:ARG:CZ	1:A:26:PRO:HG3	2.43	0.48
1:A:362:LYS:N	1:A:362:LYS:HD3	2.28	0.48
1:A:272:ASN:OD1	2:A:525:HOH:O	2.20	0.48
1:A:7:ILE:HD13	1:A:112:GLN:HB2	1.96	0.48
1:A:50:ARG:H	1:A:112:GLN:NE2	2.12	0.48
1:A:115:GLU:O	1:A:119:LYS:HG3	2.14	0.48
1:A:302:LEU:C	1:A:302:LEU:HD23	2.35	0.47
1:A:7:ILE:HD11	1:A:113:ALA:HA	1.97	0.47
1:A:6:LEU:HD23	1:A:6:LEU:C	2.35	0.47
1:A:40:LEU:HD22	1:A:316:ARG:HD2	1.96	0.47
1:A:14:LYS:HB3	1:A:14:LYS:NZ	2.29	0.47
1:A:350:THR:HG22	1:A:351:LEU:N	2.30	0.46
1:A:131:HIS:CD2	1:A:166:ASP:OD2	2.58	0.46
1:A:206:GLU:CD	1:A:206:GLU:N	2.68	0.46
1:A:232:LEU:O	1:A:236:GLU:HG3	2.16	0.46

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:208:ILE:HG22	1:A:215:GLY:H	1.81	0.46
1:A:362:LYS:N	1:A:362:LYS:CD	2.79	0.46
1:A:308:LEU:CD2	1:A:351:LEU:HD22	2.45	0.46
1:A:351:LEU:HD23	1:A:351:LEU:O	2.16	0.46
1:A:300:TYR:HB2	1:A:347:MET:HE3	1.98	0.45
1:A:208:ILE:O	1:A:208:ILE:CG2	2.63	0.45
1:A:272:ASN:ND2	2:A:393:HOH:O	2.48	0.45
1:A:353:ASP:HB2	1:A:354:PRO:HD2	1.97	0.45
1:A:35:LYS:HB2	1:A:35:LYS:HZ3	1.76	0.45
1:A:276:LEU:CD2	1:A:280:ASN:ND2	2.80	0.45
1:A:339:ASP:HB3	1:A:342:VAL:CG2	2.45	0.45
1:A:258:ASP:N	1:A:259:PRO:CD	2.80	0.45
1:A:323:ASN:CG	2:A:541:HOH:O	2.55	0.44
1:A:37:ALA:HB1	1:A:325:LYS:HG2	1.98	0.44
1:A:198:PHE:CG	1:A:199:PRO:HA	2.52	0.44
1:A:276:LEU:HD23	1:A:276:LEU:C	2.37	0.44
1:A:35:LYS:HD2	1:A:310:TRP:CD1	2.53	0.44
1:A:362:LYS:H	1:A:362:LYS:CD	2.29	0.44
1:A:92:GLU:C	1:A:94:PRO:HD3	2.38	0.44
1:A:40:LEU:CA	1:A:316:ARG:NH1	2.81	0.44
1:A:245:VAL:HG23	2:A:529:HOH:O	2.18	0.43
1:A:168:ASP:HB2	1:A:254:GLN:HE22	1.74	0.43
1:A:40:LEU:C	1:A:316:ARG:NH1	2.72	0.43
1:A:3:LYS:O	1:A:121:ASN:HB3	2.18	0.43
1:A:265:LEU:HD23	1:A:265:LEU:HA	1.74	0.43
1:A:272:ASN:CG	2:A:525:HOH:O	2.58	0.43
1:A:145:ASN:OD1	1:A:147:PRO:HD2	2.19	0.43
1:A:369:GLU:HG3	2:A:433:HOH:O	2.18	0.43
1:A:6:LEU:HD12	1:A:35:LYS:HE2	2.00	0.43
1:A:166:ASP:OD2	1:A:254:GLN:HG2	2.19	0.42
1:A:318:VAL:HG13	1:A:351:LEU:HD13	2.01	0.42
1:A:171:HIS:CE1	1:A:176:GLN:OE1	2.73	0.42
1:A:181:ASP:C	1:A:181:ASP:OD1	2.57	0.42
1:A:146:ASN:ND2	1:A:147:PRO:HD3	2.35	0.42
1:A:92:GLU:O	1:A:94:PRO:HD3	2.19	0.42
1:A:277:LYS:O	1:A:281:ILE:HG13	2.20	0.42
1:A:235:LEU:O	1:A:239:LEU:HG	2.19	0.41
1:A:339:ASP:O	1:A:340:ASP:C	2.57	0.41
1:A:41:ILE:HD13	1:A:310:TRP:CE2	2.55	0.41
1:A:84:GLU:HG2	1:A:85:LYS:H	1.85	0.41
1:A:298:HIS:CD2	1:A:300:TYR:HB2	2.56	0.41
1:A:245:VAL:HG12	1:A:245:VAL:O	2.20	0.41

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:140:GLY:O	1:A:141:PHE:HB2	2.20	0.41
1:A:87:ASN:HB2	1:A:137:ARG:HG3	2.03	0.41
1:A:30:LEU:CD2	1:A:333:ILE:HD11	2.51	0.41
1:A:6:LEU:CD2	1:A:6:LEU:C	2.89	0.41
1:A:273:VAL:HG13	2:A:523:HOH:O	2.21	0.40
1:A:319:PRO:HG2	1:A:351:LEU:HD12	2.02	0.40
1:A:261:LEU:HA	1:A:269:ASN:HA	2.03	0.40
1:A:318:VAL:CG1	1:A:351:LEU:HD13	2.52	0.40
1:A:160:LYS:CB	1:A:160:LYS:NZ	2.84	0.40
1:A:325:LYS:HB2	1:A:325:LYS:HE3	1.88	0.40

All (1) 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	Distance(Å)	Clash(Å)
1:A:20:ASN:ND2	1:A:20:ASN:ND2[2_656]	1.74	0.46

## 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	370/375 (99%)	354 (96%)	14 (4%)	2 (0%)	38 19

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	19	LYS
1	A	336	GLU

### 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	316/321 (98%)	304 (96%)	12 (4%)	44 24

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	31	LEU
1	A	83	ARG
1	A	87	ASN
1	A	131	HIS
1	A	181	ASP
1	A	218	LEU
1	A	235	LEU
1	A	247	GLU
1	A	254	GLN
1	A	317	GLU
1	A	321	LYS
1	A	340	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	21	HIS
1	A	61	HIS
1	A	87	ASN
1	A	112	GLN
1	A	121	ASN
1	A	131	HIS
1	A	132	HIS
1	A	171	HIS
1	A	191	HIS
1	A	217	ASN
1	A	229	ASN
1	A	254	GLN
1	A	272	ASN
1	A	280	ASN
1	A	298	HIS
1	A	323	ASN

### 5.3.3 RNA ⓘ

There are no RNA chains in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

## 5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

There are no ligands in this entry.

## 5.7 Other polymers ⓘ

There are no such residues in this entry.

## 5.8 Polymer linkage issues

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 will therefore be empty.

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

EDS was not executed - this section will therefore be empty.

### 6.3 Carbohydrates ⓘ

EDS was not executed - this section will therefore be empty.

### 6.4 Ligands ⓘ

EDS was not executed - this section will therefore be empty.

### 6.5 Other polymers ⓘ

EDS was not executed - this section will therefore be empty.