



# Full wwPDB X-ray Structure Validation Report ⓘ

May 22, 2020 – 01:06 pm BST

PDB ID : 1VCM  
Title : Crystal Structure of T.th. HB8 CTP synthetase  
Authors : Goto, M.; RIKEN Structural Genomics/Proteomics Initiative (RSGI)  
Deposited on : 2004-03-10  
Resolution : 2.35 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](mailto: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.

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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  
Xtriage (Phenix) : 1.13  
EDS : 2.11  
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) : 2.11

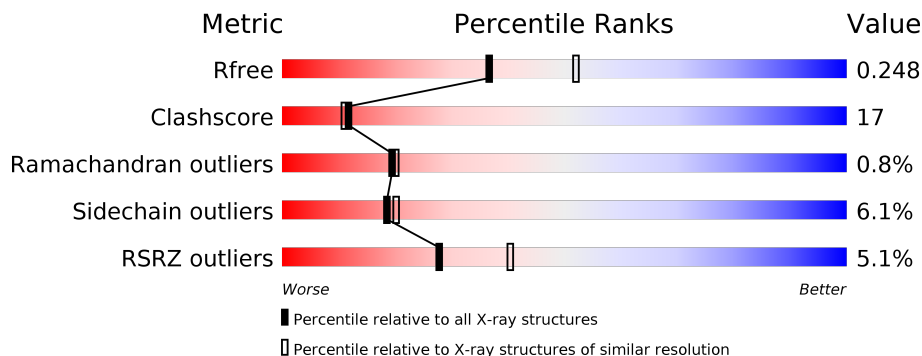
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

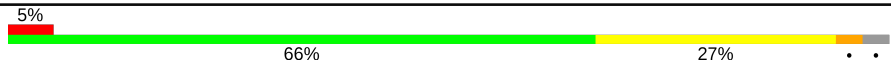
The reported resolution of this entry is 2.35 Å.

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	1164 (2.36-2.36)
Clashscore	141614	1232 (2.36-2.36)
Ramachandran outliers	138981	1211 (2.36-2.36)
Sidechain outliers	138945	1212 (2.36-2.36)
RSRZ outliers	127900	1150 (2.36-2.36)

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 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  $\leq 5\%$ . 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	550	

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 4327 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 CTP synthetase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	531	4015	2571	707	730	7	0	0	0

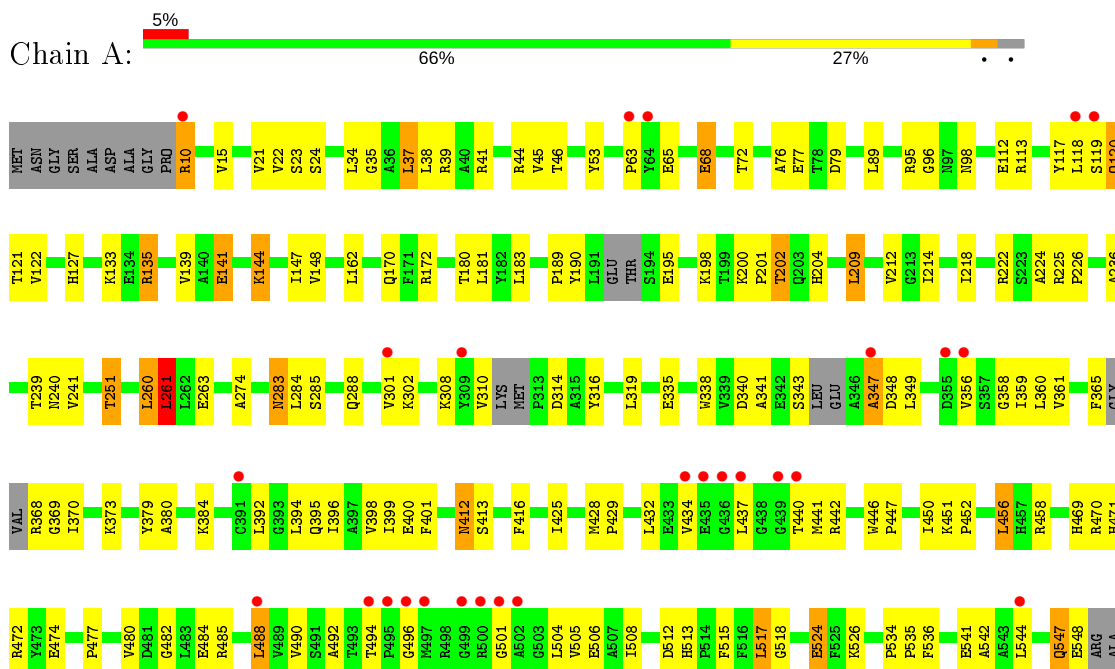
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	312	Total	O	0	0
			312	312		

### 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 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: CTP synthetase



## 4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	86.00Å 120.67Å 143.13Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 2.35 46.69 – 2.35	Depositor EDS
% Data completeness (in resolution range)	(Not available) (10.00-2.35) 99.4 (46.69-2.35)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.58 (at 2.34Å)	Xtrriage
Refinement program	CNS	Depositor
R, $R_{free}$	0.235 , 0.279 0.240 , 0.248	Depositor DCC
$R_{free}$ test set	3125 reflections (10.01%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	45.8	Xtrriage
Anisotropy	0.349	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 49.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.52$ , $\langle L^2 \rangle = 0.35$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	4327	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	43.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.66% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  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	0.37	0/4099	0.61	1/5575 (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	261	LEU	CA-CB-CG	6.21	129.59	115.30

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	4015	0	3970	139	0
2	A	312	0	0	8	1
All	All	4327	0	3970	139	1

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 17.

All (139) 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:63:PRO:HB3	1:A:470:ARG:HH21	1.12	1.10

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:308:LYS:HZ3	1:A:368:ARG:N	1.60	0.98
1:A:412:ASN:HD22	1:A:413:SER:H	1.16	0.92
1:A:494:THR:HG22	1:A:496:GLY:H	1.41	0.86
1:A:10:ARG:HH11	1:A:10:ARG:HB2	1.41	0.84
1:A:428:MET:HE1	1:A:501:GLY:HA2	1.58	0.83
1:A:308:LYS:HE2	1:A:365:PHE:O	1.78	0.83
1:A:469:HIS:HD2	1:A:471:HIS:HE1	1.30	0.80
1:A:547:GLN:O	1:A:548:GLU:HB2	1.82	0.79
1:A:63:PRO:HB3	1:A:470:ARG:NH2	1.95	0.76
1:A:395:GLN:HB3	1:A:425:ILE:HD13	1.69	0.75
1:A:412:ASN:ND2	1:A:413:SER:H	1.84	0.74
1:A:10:ARG:HH11	1:A:10:ARG:CB	2.01	0.73
1:A:112:GLU:OE2	1:A:113:ARG:HD2	1.89	0.73
1:A:77:GLU:OE2	1:A:470:ARG:NH1	2.22	0.72
1:A:209:LEU:HD22	1:A:214:ILE:HB	1.73	0.70
1:A:189:PRO:HG2	1:A:198:LYS:HB2	1.74	0.69
1:A:412:ASN:HD22	1:A:413:SER:N	1.90	0.69
1:A:534:PRO:HG2	1:A:535:PRO:HD3	1.74	0.69
1:A:301:VAL:CG1	1:A:544:LEU:HD23	2.24	0.68
1:A:202:THR:HG23	2:A:669:HOH:O	1.95	0.66
1:A:79:ASP:H	1:A:98:ASN:ND2	1.95	0.65
1:A:447:PRO:O	1:A:494:THR:HG23	1.96	0.64
1:A:135:ARG:O	1:A:139:VAL:HG23	1.97	0.63
1:A:10:ARG:HB2	1:A:10:ARG:NH1	2.13	0.62
1:A:395:GLN:CB	1:A:425:ILE:HD13	2.29	0.62
1:A:45:VAL:HG12	1:A:46:THR:N	2.14	0.62
1:A:469:HIS:CD2	1:A:471:HIS:HE1	2.15	0.61
1:A:442:ARG:HD3	1:A:474:GLU:OE1	2.01	0.60
1:A:301:VAL:HG11	1:A:544:LEU:HD23	1.83	0.60
1:A:517:LEU:HD22	1:A:518:GLY:N	2.16	0.60
1:A:239:THR:O	1:A:240:ASN:HB2	2.02	0.60
1:A:428:MET:CE	1:A:429:PRO:HD2	2.32	0.59
1:A:181:LEU:HD13	1:A:274:ALA:HB1	1.85	0.58
1:A:222:ARG:HH22	1:A:251:THR:HB	1.69	0.58
1:A:347:ALA:HA	2:A:719:HOH:O	2.04	0.58
1:A:373:LYS:CB	1:A:396:ILE:HD13	2.35	0.57
1:A:513:HIS:HD2	1:A:515:PHE:H	1.52	0.57
1:A:112:GLU:OE2	1:A:113:ARG:CD	2.53	0.56
1:A:490:VAL:HG13	1:A:505:VAL:HG13	1.87	0.56
1:A:225:ARG:HB2	1:A:226:PRO:HD2	1.87	0.56
1:A:469:HIS:HE1	2:A:663:HOH:O	1.88	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:526:LYS:HG3	2:A:736:HOH:O	2.04	0.56
1:A:494:THR:OG1	1:A:506:GLU:OE1	2.23	0.56
1:A:373:LYS:HB3	1:A:396:ILE:HD13	1.88	0.56
1:A:301:VAL:HG13	1:A:544:LEU:HD23	1.89	0.55
1:A:494:THR:HG22	1:A:496:GLY:N	2.17	0.55
1:A:200:LYS:HB3	1:A:201:PRO:HD3	1.89	0.54
1:A:441:MET:HB2	1:A:471:HIS:O	2.08	0.54
1:A:35:GLY:HA3	1:A:89:LEU:HD21	1.89	0.54
1:A:133:LYS:HZ2	1:A:170:GLN:HE21	1.56	0.54
1:A:340:ASP:O	1:A:341:ALA:HB3	2.08	0.54
1:A:76:ALA:HB2	1:A:95:ARG:HB3	1.88	0.54
1:A:263:GLU:HG2	1:A:284:LEU:HD11	1.89	0.53
1:A:450:ILE:HG23	1:A:456:LEU:HD13	1.91	0.53
1:A:469:HIS:HD2	1:A:471:HIS:CE1	2.19	0.53
1:A:394:LEU:C	1:A:394:LEU:HD23	2.29	0.53
1:A:310:VAL:HG13	1:A:338:TRP:HB3	1.90	0.53
1:A:401:PHE:CE2	1:A:488:LEU:HB2	2.44	0.53
1:A:224:ALA:HA	1:A:251:THR:CG2	2.38	0.53
1:A:384:LYS:NZ	1:A:512:ASP:O	2.41	0.52
1:A:428:MET:HE3	1:A:429:PRO:HD2	1.91	0.52
1:A:370:ILE:HD11	1:A:392:LEU:HD21	1.91	0.52
1:A:225:ARG:HG2	1:A:225:ARG:HH11	1.74	0.52
1:A:441:MET:HB3	1:A:472:ARG:HB3	1.92	0.50
1:A:316:TYR:HB3	1:A:319:LEU:HB3	1.92	0.50
1:A:224:ALA:O	1:A:251:THR:HG23	2.11	0.50
1:A:260:LEU:HD21	1:A:288:GLN:HA	1.94	0.50
1:A:360:LEU:HD23	1:A:360:LEU:C	2.32	0.50
1:A:117:TYR:O	1:A:120:GLN:HG3	2.13	0.49
1:A:68:GLU:HB3	1:A:314:ASP:O	2.13	0.49
1:A:494:THR:C	1:A:496:GLY:H	2.15	0.49
1:A:122:VAL:HG13	1:A:127:HIS:CG	2.49	0.48
1:A:513:HIS:CD2	1:A:515:PHE:H	2.31	0.48
1:A:428:MET:HE2	1:A:429:PRO:HD2	1.96	0.48
1:A:118:LEU:O	1:A:119:SER:HB2	2.14	0.48
1:A:15:VAL:HG11	1:A:34:LEU:HD21	1.95	0.48
1:A:37:LEU:HG	1:A:263:GLU:OE1	2.13	0.48
1:A:508:ILE:C	1:A:508:ILE:HD12	2.34	0.47
1:A:283:ASN:C	1:A:283:ASN:HD22	2.17	0.47
1:A:380:ALA:O	1:A:513:HIS:HE1	1.97	0.47
1:A:190:TYR:CZ	1:A:195:GLU:HA	2.50	0.47
1:A:349:LEU:HD23	1:A:379:TYR:HB2	1.97	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:359:ILE:HD12	1:A:380:ALA:HB2	1.97	0.46
1:A:356:VAL:HG12	1:A:358:GLY:H	1.80	0.46
1:A:35:GLY:HA3	1:A:89:LEU:CD2	2.46	0.46
1:A:45:VAL:CG1	1:A:46:THR:N	2.79	0.46
1:A:172:ARG:HD3	1:A:180:THR:OG1	2.16	0.46
1:A:413:SER:HA	1:A:425:ILE:O	2.16	0.46
1:A:428:MET:CE	1:A:432:LEU:HB2	2.45	0.46
1:A:21:VAL:HG12	1:A:22:VAL:HG13	1.99	0.45
1:A:477:PRO:O	1:A:480:VAL:HG23	2.16	0.45
1:A:442:ARG:NH2	1:A:506:GLU:OE1	2.50	0.45
1:A:370:ILE:HG13	1:A:416:PHE:CD2	2.52	0.45
1:A:39:ARG:HD3	1:A:89:LEU:O	2.17	0.44
1:A:446:TRP:HE3	1:A:494:THR:HG21	1.82	0.44
1:A:360:LEU:HD23	1:A:361:VAL:N	2.33	0.44
1:A:72:THR:OG1	1:A:76:ALA:HB3	2.17	0.44
1:A:394:LEU:O	1:A:398:VAL:HG23	2.18	0.44
1:A:141:GLU:HA	1:A:141:GLU:OE1	2.18	0.43
1:A:283:ASN:ND2	1:A:285:SER:H	2.16	0.43
1:A:370:ILE:CD1	1:A:392:LEU:HD21	2.47	0.43
1:A:440:THR:HG22	2:A:625:HOH:O	2.17	0.43
1:A:494:THR:C	1:A:496:GLY:N	2.71	0.43
1:A:96:GLY:O	1:A:139:VAL:HG21	2.19	0.43
1:A:183:LEU:HG	1:A:218:ILE:HB	2.01	0.43
1:A:209:LEU:O	1:A:212:VAL:HG22	2.18	0.43
1:A:341:ALA:C	1:A:343:SER:H	2.20	0.43
1:A:190:TYR:CE1	1:A:225:ARG:NH1	2.87	0.43
1:A:224:ALA:HA	1:A:251:THR:HG22	2.01	0.43
1:A:368:ARG:O	1:A:370:ILE:N	2.45	0.43
1:A:434:VAL:HB	1:A:437:LEU:HD12	2.00	0.43
1:A:45:VAL:HG12	1:A:46:THR:H	1.81	0.43
1:A:302:LYS:HA	1:A:335:GLU:O	2.19	0.42
1:A:451:LYS:HA	1:A:452:PRO:HD3	1.93	0.42
1:A:534:PRO:CG	1:A:535:PRO:HD3	2.45	0.42
1:A:349:LEU:HB3	1:A:379:TYR:CD2	2.55	0.42
1:A:484:GLU:HA	1:A:488:LEU:O	2.19	0.42
1:A:547:GLN:O	1:A:547:GLN:HG3	2.19	0.42
1:A:261:LEU:HD23	1:A:261:LEU:C	2.39	0.42
1:A:542:ALA:HA	2:A:858:HOH:O	2.19	0.41
1:A:200:LYS:HB2	1:A:200:LYS:HE2	1.87	0.41
1:A:285:SER:HA	1:A:288:GLN:NE2	2.36	0.41
1:A:428:MET:HE3	1:A:504:LEU:HD21	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:236:ALA:HB1	1:A:241:VAL:O	2.20	0.41
1:A:38:LEU:HD13	1:A:147:ILE:HG21	2.02	0.41
1:A:399:ILE:HG13	1:A:425:ILE:HD12	2.02	0.41
1:A:341:ALA:C	1:A:343:SER:N	2.73	0.41
1:A:373:LYS:HB2	1:A:396:ILE:HD13	2.02	0.41
1:A:506:GLU:HA	1:A:506:GLU:OE2	2.20	0.41
1:A:23:SER:O	1:A:24:SER:HB3	2.20	0.41
1:A:482:GLY:HA2	1:A:485:ARG:HH11	1.85	0.41
1:A:39:ARG:C	1:A:41:ARG:H	2.25	0.41
1:A:456:LEU:CD1	1:A:492:ALA:HB2	2.51	0.41
1:A:144:LYS:HE3	2:A:782:HOH:O	2.21	0.41
1:A:524:GLU:HG3	1:A:536:PHE:CZ	2.56	0.40
1:A:44:ARG:CB	2:A:820:HOH:O	2.69	0.40
1:A:133:LYS:NZ	1:A:170:GLN:HE21	2.18	0.40
1:A:458:ARG:NH2	1:A:541:GLU:OE1	2.55	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	Interatomic distance (Å)	Clash overlap (Å)
2:A:563:HOH:O	2:A:563:HOH:O 3_556	1.28	0.92

## 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	521/550 (95%)	497 (95%)	20 (4%)	4 (1%)	19 20

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	65	GLU

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Mol	Chain	Res	Type
1	A	369	GLY
1	A	348	ASP
1	A	347	ALA

### 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	407/455 (90%)	382 (94%)	25 (6%)	18 20

All (25) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	10	ARG
1	A	37	LEU
1	A	53	TYR
1	A	68	GLU
1	A	120	GLN
1	A	121	THR
1	A	135	ARG
1	A	141	GLU
1	A	144	LYS
1	A	148	VAL
1	A	162	LEU
1	A	202	THR
1	A	204	HIS
1	A	209	LEU
1	A	251	THR
1	A	260	LEU
1	A	261	LEU
1	A	283	ASN
1	A	400	GLU
1	A	412	ASN
1	A	456	LEU
1	A	488	LEU
1	A	517	LEU

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Mol	Chain	Res	Type
1	A	524	GLU
1	A	547	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	55	ASN
1	A	98	ASN
1	A	120	GLN
1	A	170	GLN
1	A	283	ASN
1	A	288	GLN
1	A	378	GLN
1	A	404	ASN
1	A	412	ASN
1	A	457	HIS
1	A	469	HIS
1	A	471	HIS
1	A	513	HIS

### 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 carbohydrates 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<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	531/550 (96%)	0.41	27 (5%) <span style="border: 1px solid red; padding: 2px;">28</span> <span style="border: 1px solid red; padding: 2px;">40</span>	24, 42, 63, 77	0

All (27) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	347	ALA	4.5
1	A	499	GLY	3.7
1	A	439	GLY	3.6
1	A	497	MET	3.6
1	A	63	PRO	3.3
1	A	436	GLY	3.3
1	A	501	GLY	3.3
1	A	440	THR	3.2
1	A	437	LEU	3.1
1	A	64	TYR	3.0
1	A	496	GLY	2.9
1	A	435	GLU	2.8
1	A	118	LEU	2.8
1	A	495	PRO	2.6
1	A	488	LEU	2.5
1	A	309	TYR	2.5
1	A	500	ARG	2.4
1	A	434	VAL	2.3
1	A	10	ARG	2.3
1	A	355	ASP	2.3
1	A	502	ALA	2.3
1	A	119	SER	2.2
1	A	494	THR	2.2
1	A	544	LEU	2.2
1	A	356	VAL	2.1
1	A	301	VAL	2.0
1	A	391	CYS	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 carbohydrates 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.