



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 8, 2026 – 12:30 PM UTC

PDB ID : 2A7S / pdb_00002a7s
Title : Crystal Structure of the Acyl-CoA Carboxylase, AccD5, from Mycobacterium tuberculosis
Authors : Lin, T.; Melgar, M.; Purdon, J.; Tseng, T.; Tsai, S.C.
Deposited on : 2005-07-06
Resolution : 2.90 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 : 4-5-2 with Phenix2.0
Xtrriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

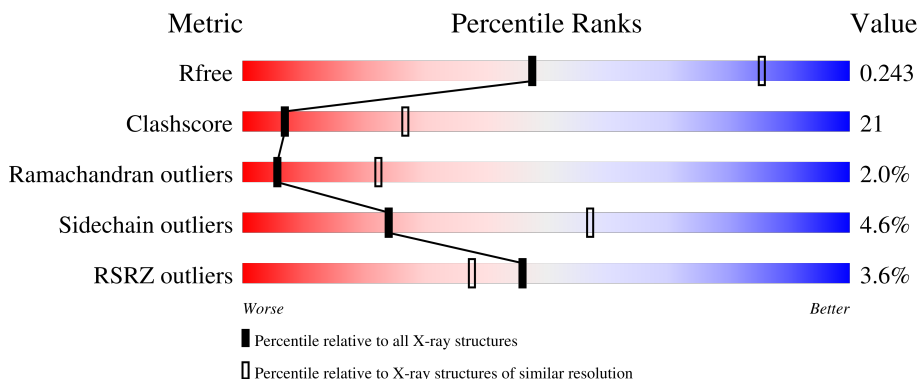
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.90 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.



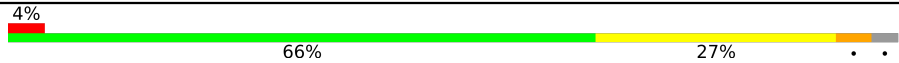
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	2481 (2.90-2.90)
Clashscore	190562	2690 (2.90-2.90)
Ramachandran outliers	187476	2623 (2.90-2.90)
Sidechain outliers	187428	2625 (2.90-2.90)
RSRZ outliers	180081	2481 (2.90-2.90)

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 $\leq 5\%$. 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	548	
1	B	548	
1	C	548	
1	D	548	
1	E	548	

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Mol	Chain	Length	Quality of chain
1	F	548	 <p>A horizontal bar chart representing the quality of chain. The bar is divided into segments: a small red segment at the beginning labeled '4%', a large green segment labeled '66%', and a yellow segment labeled '27%'. The bar ends with a small grey segment and two dots.</p>

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 25316 atoms, of which 0 are hydrogens and 0 are deuteriums.

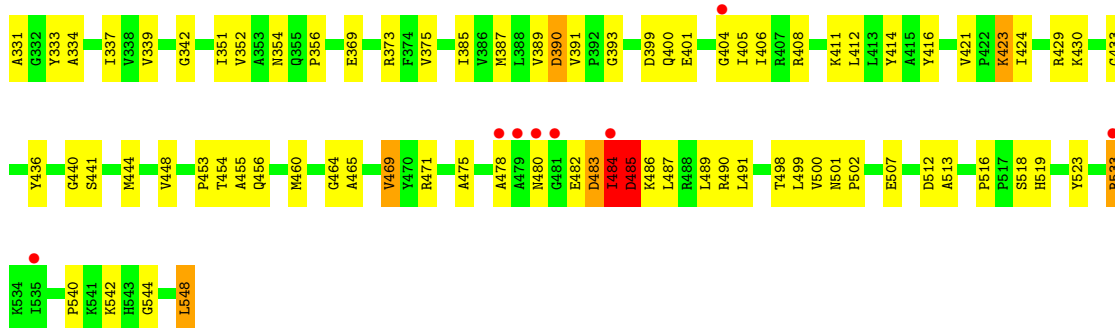
In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Probable propionyl-CoA carboxylase beta chain 5.

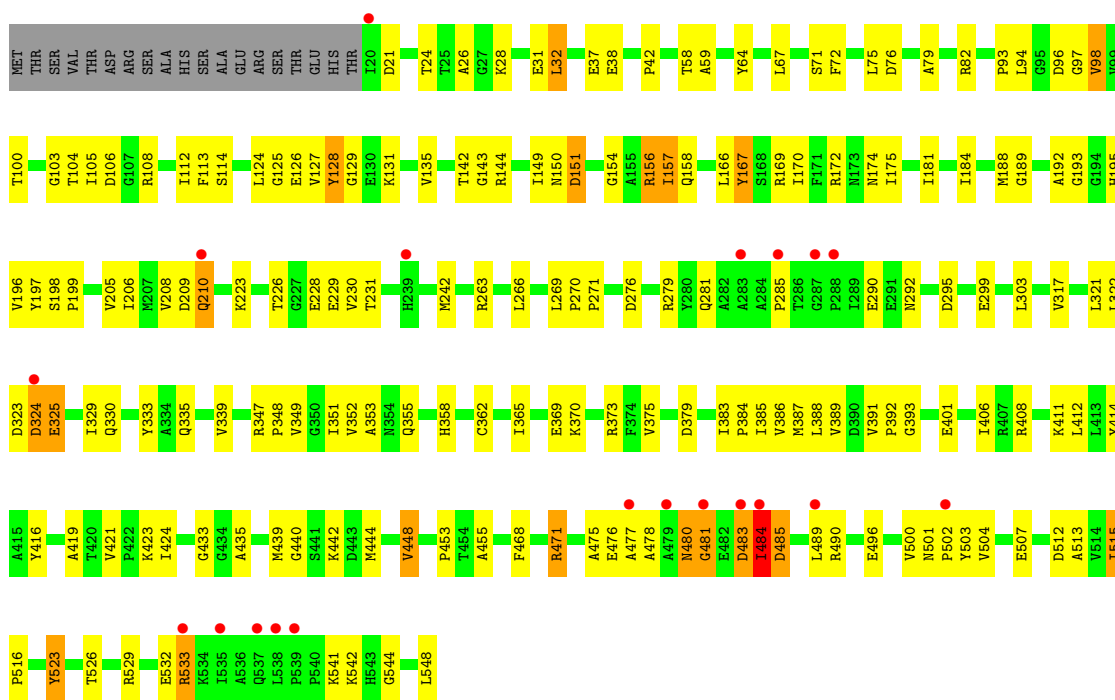
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	529	4030	2539	698	777	16	0	0	0
1	B	529	4030	2539	698	777	16	0	0	0
1	C	529	4030	2539	698	777	16	0	0	0
1	D	529	4030	2539	698	777	16	0	0	0
1	E	529	4030	2539	698	777	16	0	0	0
1	F	529	4030	2539	698	777	16	0	0	0

- Molecule 2 is water.

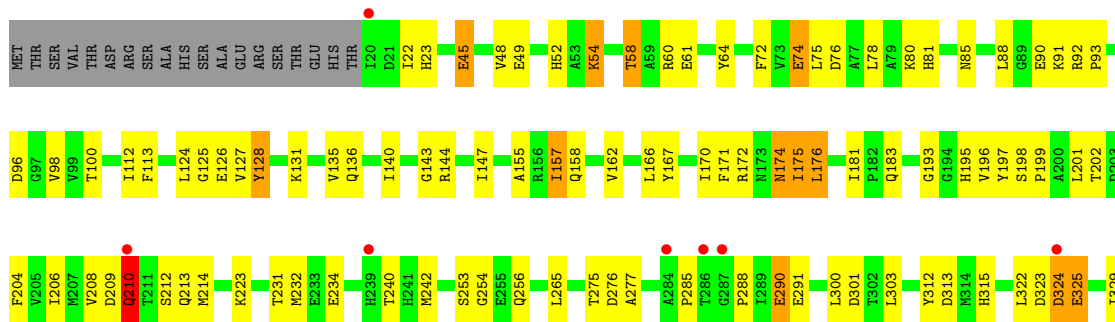
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	203	Total 203	O 203	0	0
2	B	220	Total 220	O 220	0	0
2	C	176	Total 176	O 176	0	0
2	D	175	Total 175	O 175	0	0
2	E	187	Total 187	O 187	0	0
2	F	175	Total 175	O 175	0	0

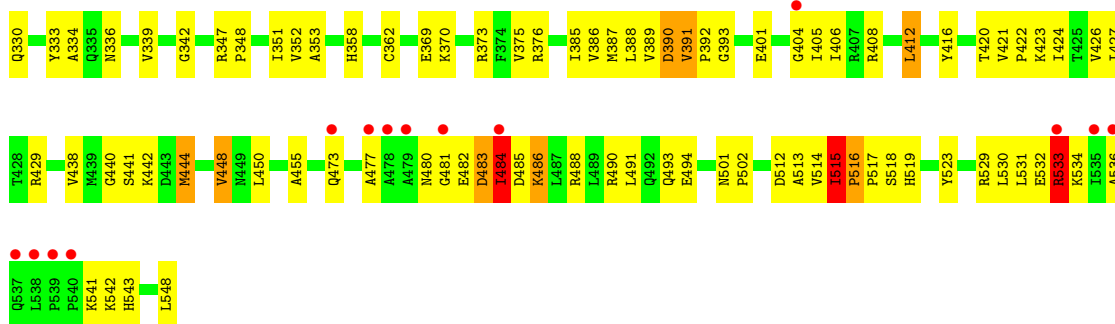


• Molecule 1: Probable propionyl-CoA carboxylase beta chain 5

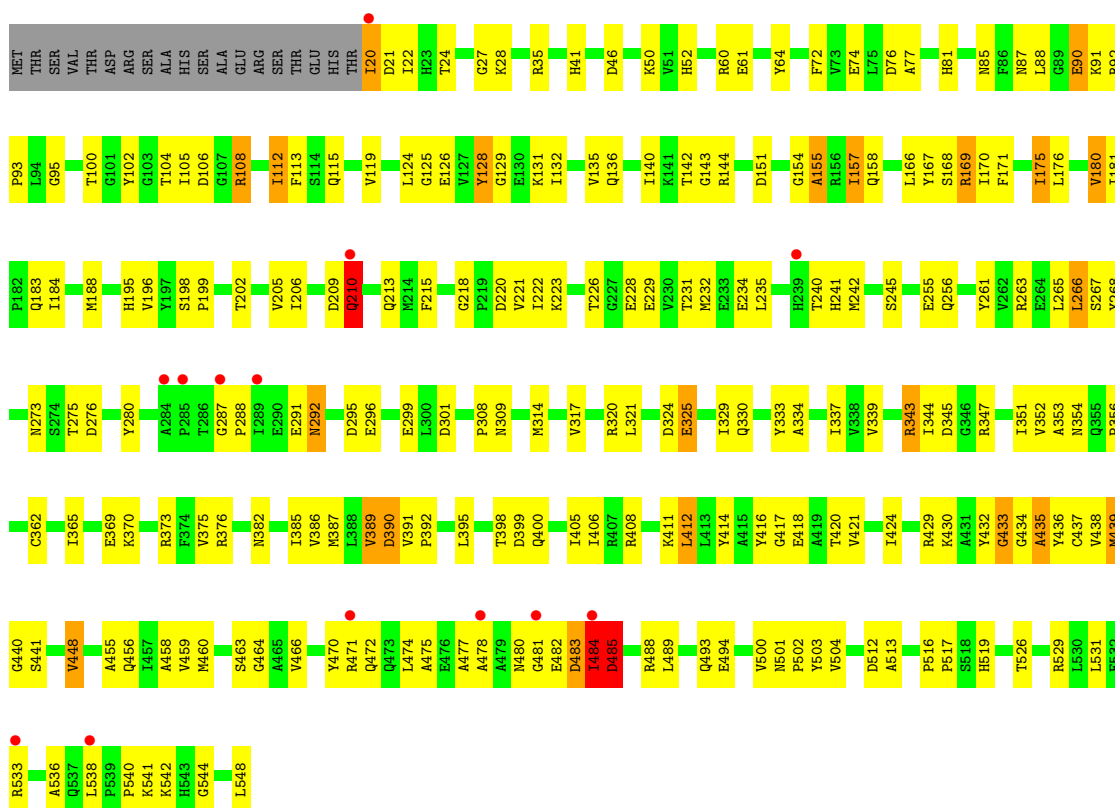


• Molecule 1: Probable propionyl-CoA carboxylase beta chain 5

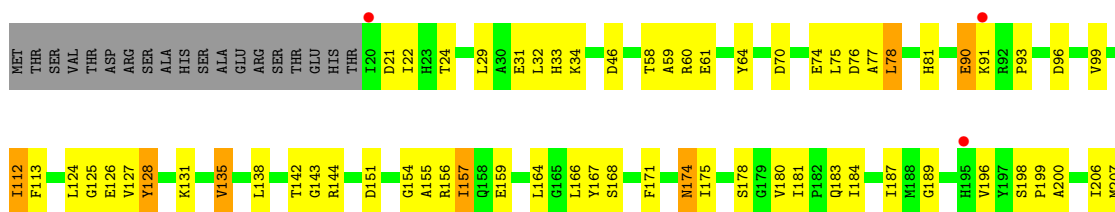


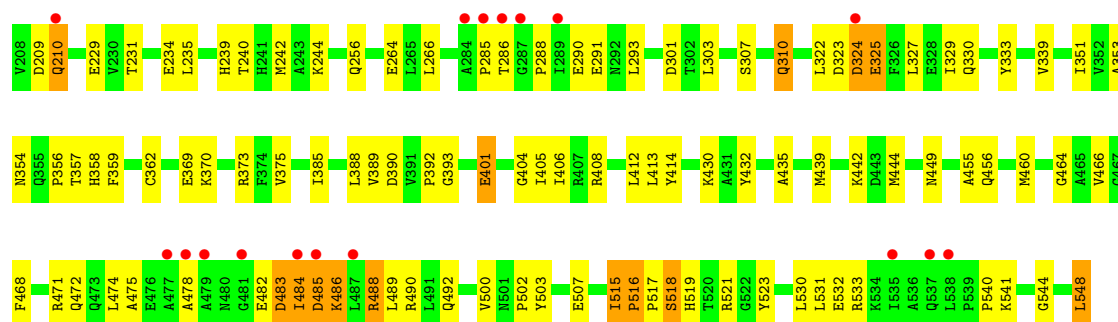


● Molecule 1: Probable propionyl-CoA carboxylase beta chain 5



● Molecule 1: Probable propionyl-CoA carboxylase beta chain 5





4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	175.25Å 175.25Å 343.00Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.88 – 2.90 47.88 – 2.90	Depositor EDS
% Data completeness (in resolution range)	91.5 (47.88-2.90) 91.5 (47.88-2.90)	Depositor EDS
R_{merge}	0.16	Depositor
R_{sym}	0.11	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.56 (at 2.91Å)	Xtrriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.193 , 0.245 0.192 , 0.243	Depositor DCC
R_{free} test set	10829 reflections (9.41%)	wwPDB-VP
Wilson B-factor (Å ²)	39.3	Xtrriage
Anisotropy	0.038	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 45.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	25316	wwPDB-VP
Average B, all atoms (Å ²)	39.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.15% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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	0.48	0/4107	0.95	10/5576 (0.2%)
1	B	0.49	0/4107	0.91	1/5576 (0.0%)
1	C	0.53	0/4107	0.97	1/5576 (0.0%)
1	D	0.51	0/4107	0.96	6/5576 (0.1%)
1	E	0.51	0/4107	0.96	9/5576 (0.2%)
1	F	0.50	0/4107	0.95	10/5576 (0.2%)
All	All	0.50	0/24642	0.95	37/33456 (0.1%)

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	C	0	1
1	D	0	1
All	All	0	2

There are no bond length outliers.

The worst 5 of 37 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	516	PRO	N-CA-CB	9.04	108.25	103.19
1	B	157	ILE	N-CA-C	6.50	118.03	110.62
1	D	391	VAL	O-C-N	6.01	127.08	121.61
1	E	112	ILE	N-CA-C	5.85	117.51	108.44
1	E	389	VAL	N-CA-C	5.82	117.71	108.87

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	C	128	TYR	Sidechain
1	D	128	TYR	Sidechain

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	4030	0	3997	186	0
1	B	4030	0	3997	165	0
1	C	4030	0	3997	166	0
1	D	4030	0	3997	167	0
1	E	4030	0	3997	209	0
1	F	4030	0	3997	157	0
2	A	203	0	0	19	0
2	B	220	0	0	22	0
2	C	176	0	0	15	0
2	D	175	0	0	9	0
2	E	187	0	0	31	0
2	F	175	0	0	26	0
All	All	25316	0	23982	1015	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 21.

The worst 5 of 1015 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:C:484:ILE:O	1:C:485:ASP:HB2	1.46	1.11
1:A:209:ASP:O	1:A:210:GLN:HB2	1.31	1.09
1:C:483:ASP:O	1:C:484:ILE:O	1.69	1.09
1:F:485:ASP:CB	1:F:488:ARG:HB2	1.83	1.08
1:D:209:ASP:O	1:D:210:GLN:HB2	1.38	1.08

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	527/548 (96%)	476 (90%)	44 (8%)	7 (1%)	9	32
1	B	527/548 (96%)	482 (92%)	34 (6%)	11 (2%)	5	21
1	C	527/548 (96%)	477 (90%)	37 (7%)	13 (2%)	4	17
1	D	527/548 (96%)	474 (90%)	43 (8%)	10 (2%)	6	23
1	E	527/548 (96%)	470 (89%)	45 (8%)	12 (2%)	5	19
1	F	527/548 (96%)	484 (92%)	33 (6%)	10 (2%)	6	23
All	All	3162/3288 (96%)	2863 (90%)	236 (8%)	63 (2%)	6	22

5 of 63 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	210	GLN
1	A	480	ASN
1	A	483	ASP
1	B	325	GLU
1	B	480	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	423/440 (96%)	395 (93%)	28 (7%)	15	43
1	B	423/440 (96%)	409 (97%)	14 (3%)	33	67
1	C	423/440 (96%)	407 (96%)	16 (4%)	29	64

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	D	423/440 (96%)	400 (95%)	23 (5%)	20	51
1	E	423/440 (96%)	403 (95%)	20 (5%)	23	56
1	F	423/440 (96%)	406 (96%)	17 (4%)	28	62
All	All	2538/2640 (96%)	2420 (95%)	118 (5%)	24	57

5 of 118 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	548	LEU
1	F	310	GLN
1	D	412	LEU
1	F	266	LEU
1	E	533	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 68 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	403	ASN
1	F	174	ASN
1	F	456	GLN
1	C	315	HIS
1	C	292	ASN

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 oligosaccharides 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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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, 95th 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	529/548 (96%)	-0.07	23 (4%) 40 31	19, 34, 86, 125	0
1	B	529/548 (96%)	-0.10	17 (3%) 50 41	19, 35, 82, 132	0
1	C	529/548 (96%)	-0.07	20 (3%) 44 36	18, 32, 86, 138	0
1	D	529/548 (96%)	-0.14	21 (3%) 42 34	18, 33, 84, 134	0
1	E	529/548 (96%)	-0.19	13 (2%) 58 48	18, 32, 75, 128	0
1	F	529/548 (96%)	-0.08	20 (3%) 44 36	18, 35, 82, 125	0
All	All	3174/3288 (96%)	-0.11	114 (3%) 46 38	18, 33, 84, 138	0

The worst 5 of 114 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	538	LEU	5.2
1	A	484	ILE	4.7
1	E	239	HIS	4.5
1	F	485	ASP	4.5
1	A	210	GLN	4.3

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 oligosaccharides 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.