



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 28, 2024 – 04:41 pm BST

PDB ID : 2YL2
Title : Crystal structure of human acetyl-CoA carboxylase 1, biotin carboxylase (BC) domain
Authors : Muniz, J.R.C.; Froese, D.S.; Kryzstofinska, E.; Vollmar, M.; Beltrami, A.; Krojer, T.; von Delft, F.; Arrowsmith, C.H.; Edwards, A.M.; Weigelt, J.; Bountra, C.; Yue, W.W.; Oppermann, U.
Deposited on : 2011-05-31
Resolution : 2.30 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 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 : 4.02b-467
Xtriage (Phenix) : 1.13
EDS : 2.36.2
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) : 2.36.2

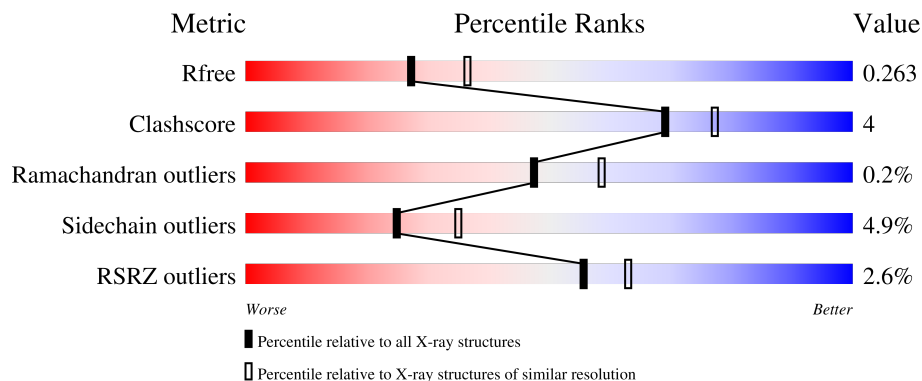
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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	540	 3% 78% 11% 11%
1	B	540	 2% 79% 11% 10%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 7627 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 ACETYL-COA CARBOXYLASE 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	482	3664	2336	634	672	22	0	2	0
1	B	486	3750	2397	645	686	22	0	2	0

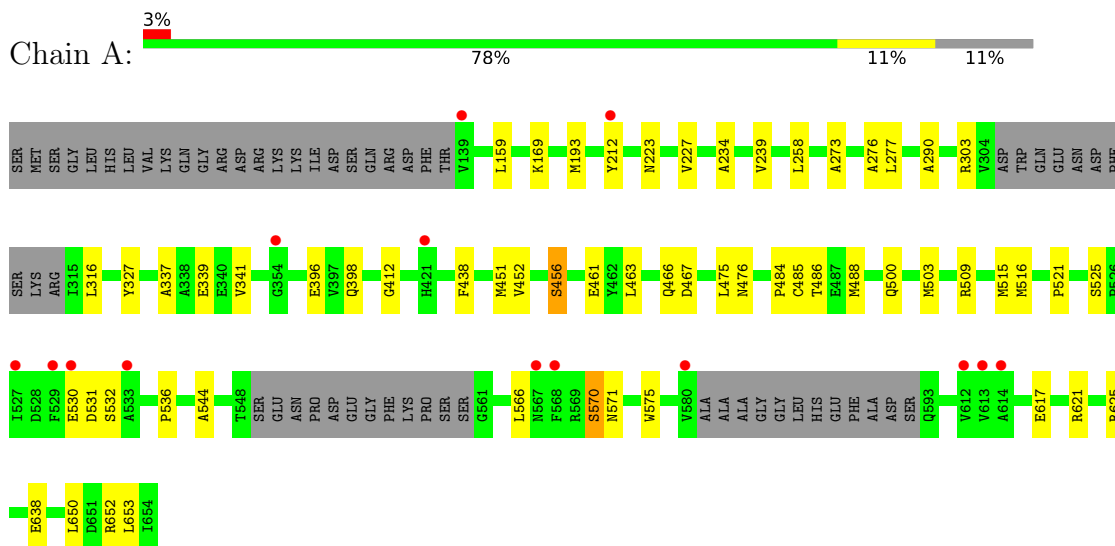
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	102	102	102	0	0
2	B	111	111	111	0	0

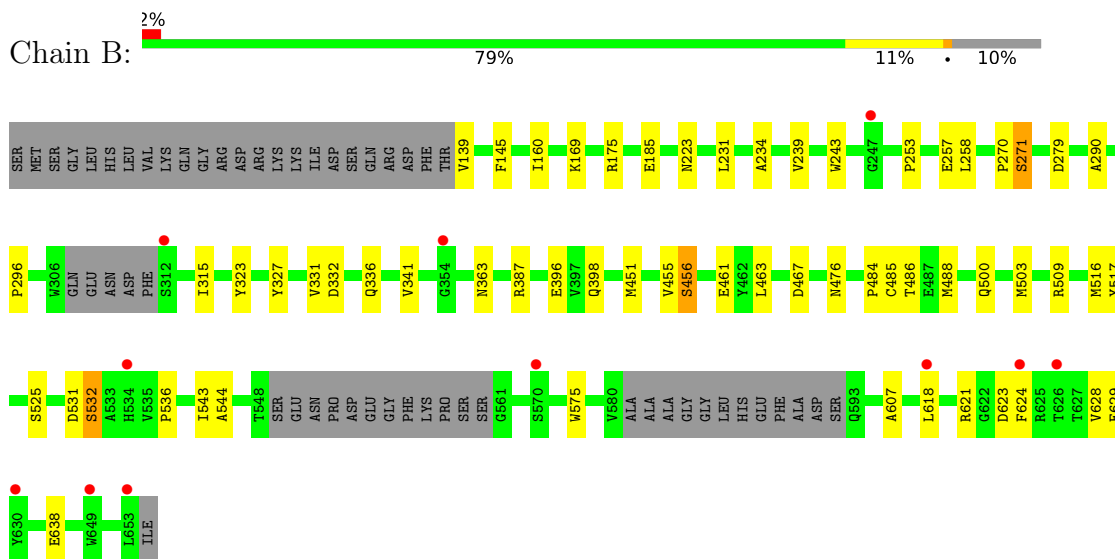
3 Residue-property plots

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 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: ACETYL-COA CARBOXYLASE 1



• Molecule 1: ACETYL-COA CARBOXYLASE 1



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	60.67Å 60.87Å 70.37Å 92.04° 98.00° 92.20°	Depositor
Resolution (Å)	33.67 – 2.30 49.00 – 2.30	Depositor EDS
% Data completeness (in resolution range)	(Not available) (33.67-2.30) 96.6 (49.00-2.30)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.07 (at 2.29Å)	Xtrriage
Refinement program	BUSTER 2.8.0	Depositor
R, R_{free}	0.206 , 0.241 0.217 , 0.263	Depositor DCC
R_{free} test set	2166 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å ²)	38.3	Xtrriage
Anisotropy	0.081	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 49.7	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	0.94	EDS
Total number of atoms	7627	wwPDB-VP
Average B, all atoms (Å ²)	46.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.32% 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	0.50	0/3751	0.69	0/5104
1	B	0.51	0/3839	0.68	0/5218
All	All	0.51	0/7590	0.69	0/10322

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 [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	3664	0	3530	25	0
1	B	3750	0	3644	29	0
2	A	102	0	0	1	0
2	B	111	0	0	4	0
All	All	7627	0	7174	54	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 4.

All (54) 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:B:509:ARG:NH1	2:B:2096:HOH:O	2.13	0.81

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:363:ASN:HB2	2:B:2057:HOH:O	1.94	0.68
1:A:276:ALA:HB3	1:A:452:VAL:HG11	1.75	0.67
1:A:488:MET:CE	1:A:575:TRP:HE1	2.11	0.63
1:B:488:MET:CE	1:B:575:TRP:HE1	2.10	0.63
1:B:396:GLU:HG2	1:B:461:GLU:HG2	1.83	0.61
1:A:650:LEU:HD23	1:A:653:LEU:HD12	1.84	0.59
1:B:618:LEU:HD23	1:B:628:VAL:HG11	1.85	0.58
1:A:396:GLU:HG2	1:A:461:GLU:HG2	1.88	0.55
1:B:488:MET:HE1	1:B:575:TRP:HE1	1.73	0.54
1:B:290:ALA:HB2	1:B:451:MET:SD	2.48	0.54
1:A:277:LEU:HB3	1:A:475:LEU:HD13	1.90	0.51
1:A:488:MET:HE1	1:A:575:TRP:HE1	1.75	0.51
1:A:277:LEU:O	1:A:475:LEU:HB3	2.12	0.50
1:B:257:GLU:HB2	1:B:271:SER:OG	2.13	0.49
1:B:279:ASP:OD2	1:B:323:TYR:OH	2.30	0.48
1:A:290:ALA:HB2	1:A:451:MET:SD	2.54	0.48
1:B:175:ARG:HG2	1:B:185:GLU:O	2.14	0.48
1:A:485:CYS:SG	1:A:544:ALA:HB2	2.54	0.48
1:A:488:MET:HE2	1:A:575:TRP:HE1	1.79	0.47
1:A:337:ALA:O	1:A:341:VAL:HG22	2.15	0.47
1:A:516:MET:HG2	1:A:536:PRO:HB3	1.97	0.46
1:B:485:CYS:SG	1:B:544:ALA:HB2	2.55	0.46
1:B:296:PRO:HB2	1:B:341:VAL:HG13	1.97	0.46
1:B:488:MET:HE2	1:B:575:TRP:HE1	1.79	0.46
1:B:500:GLN:HA	1:B:503:MET:HE2	1.96	0.46
1:B:231:LEU:HD13	1:B:258:LEU:HB3	1.98	0.46
1:B:516:MET:HG2	1:B:536:PRO:HB3	1.97	0.46
1:A:500:GLN:HA	1:A:503:MET:HE2	1.98	0.45
1:A:509:ARG:NH1	2:A:2097:HOH:O	2.48	0.45
1:A:570:SER:HB2	1:A:617:GLU:OE1	2.16	0.45
1:B:160:ILE:HG23	1:B:243:TRP:HE3	1.82	0.45
1:B:253:PRO:O	1:B:271:SER:OG	2.34	0.44
1:B:621:ARG:HD2	1:B:624:PHE:CD2	2.53	0.44
1:B:336:GLN:NE2	2:B:2056:HOH:O	2.51	0.43
1:A:515:MET:SD	1:A:521:PRO:HB3	2.59	0.42
1:B:139:VAL:HG11	1:B:145:PHE:HA	2.01	0.42
1:B:270:PRO:HD3	1:B:455:VAL:HB	2.01	0.42
1:B:169:LYS:HE3	1:B:484:PRO:HG3	2.01	0.42
1:A:488:MET:HE1	1:A:575:TRP:NE1	2.34	0.42
1:B:398:GLN:HG2	1:B:486:THR:HG21	2.01	0.42
1:B:543:ILE:HG12	1:B:607:ALA:HB1	2.02	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:159:LEU:HD11	1:A:193:MET:HE3	2.02	0.42
1:A:398:GLN:HG2	1:A:486:THR:HG21	2.02	0.42
1:B:488:MET:HE1	1:B:575:TRP:NE1	2.32	0.41
1:B:517:TYR:HD2	1:B:532:SER:HB2	1.85	0.41
1:A:169:LYS:HE3	1:A:484:PRO:HG3	2.03	0.41
1:A:227:VAL:HG12	1:A:258:LEU:HD12	2.02	0.41
1:A:412:GLY:HA3	1:A:438:PHE:CZ	2.56	0.41
1:B:467:ASP:HB2	2:B:2082:HOH:O	2.19	0.41
1:A:234:ALA:HA	1:A:239:VAL:HG22	2.02	0.41
1:A:273:ALA:HA	1:A:452:VAL:HG12	2.03	0.41
1:A:532:SER:O	1:A:536:PRO:HD3	2.21	0.40
1:B:234:ALA:HA	1:B:239:VAL:HG22	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	476/540 (88%)	460 (97%)	15 (3%)	1 (0%)	47	58
1	B	480/540 (89%)	465 (97%)	14 (3%)	1 (0%)	47	58
All	All	956/1080 (88%)	925 (97%)	29 (3%)	2 (0%)	47	58

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	456	SER
1	B	456	SER

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	369/450 (82%)	347 (94%)	22 (6%)	19	26
1	B	383/450 (85%)	367 (96%)	16 (4%)	30	42
All	All	752/900 (84%)	714 (95%)	38 (5%)	25	33

All (38) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	212	TYR
1	A	223	ASN
1	A	303	ARG
1	A	316	LEU
1	A	327	TYR
1	A	339	GLU
1	A	456	SER
1	A	463	LEU
1	A	466	GLN
1	A	467	ASP
1	A	476	ASN
1	A	525	SER
1	A	530	GLU
1	A	531	ASP
1	A	566	LEU
1	A	570	SER
1	A	571	ASN
1	A	621	ARG
1	A	625	ARG
1	A	638	GLU
1	A	652[A]	ARG
1	A	652[B]	ARG
1	B	223	ASN
1	B	271	SER
1	B	315	ILE
1	B	327	TYR
1	B	331	VAL

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Mol	Chain	Res	Type
1	B	332	ASP
1	B	387	ARG
1	B	456	SER
1	B	463	LEU
1	B	476	ASN
1	B	525	SER
1	B	531	ASP
1	B	532	SER
1	B	623	ASP
1	B	629	GLU
1	B	638	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	262	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 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

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, 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	482/540 (89%)	0.16	14 (2%) 51 58	23, 44, 76, 95	0
1	B	486/540 (90%)	0.09	11 (2%) 60 67	22, 42, 71, 92	0
All	All	968/1080 (89%)	0.13	25 (2%) 56 63	22, 44, 74, 95	0

All (25) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	533	ALA	3.9
1	B	354	GLY	3.1
1	B	312	SER	3.1
1	B	624	PHE	2.8
1	A	614	ALA	2.8
1	A	527	ILE	2.7
1	B	534	HIS	2.7
1	A	529	PHE	2.7
1	A	568	PHE	2.7
1	A	567	ASN	2.4
1	B	570	SER	2.4
1	A	613	VAL	2.4
1	B	626	THR	2.4
1	A	212	TYR	2.4
1	B	630[A]	TYR	2.3
1	A	139	VAL	2.3
1	B	247	GLY	2.3
1	B	649	TRP	2.2
1	A	354	GLY	2.2
1	A	580	VAL	2.2
1	B	618	LEU	2.1
1	B	653	LEU	2.1
1	A	530	GLU	2.1
1	A	612	VAL	2.0

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Mol	Chain	Res	Type	RSRZ
1	A	421	HIS	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 monosaccharides 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.