



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 20, 2026 – 02:33 AM UTC

PDB ID : 1VRG / pdb_00001vrg
Title : Crystal structure of propionyl-CoA carboxylase, beta subunit (TM0716) from THERMOTOGA MARITIMA at 2.30 Å resolution
Authors : Joint Center for Structural Genomics (JCSG)
Deposited on : 2005-02-22
Resolution : 2.30 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

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<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
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (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

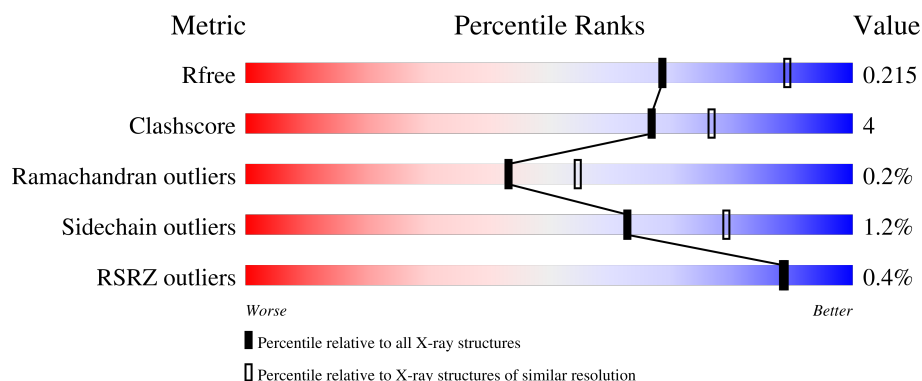
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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}	180053	6319 (2.30-2.30)
Clashscore	190562	6919 (2.30-2.30)
Ramachandran outliers	187476	6854 (2.30-2.30)
Sidechain outliers	187428	6854 (2.30-2.30)
RSRZ outliers	180081	6325 (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	527	 87% 10% .
1	B	527	 87% 10% .
1	C	527	 91% 6% ..
1	D	527	 90% 7% ..
1	E	527	 91% 6% ..

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Mol	Chain	Length	Quality of chain
1	F	527	 88% 9% ..

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	BCT	A	517	-	-	X	-

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 25115 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 propionyl-CoA carboxylase, beta subunit.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	515	Total	C	N	O	S	Se	0	3	0
			3946	2518	668	744	2	14			
1	B	515	Total	C	N	O	S	Se	0	1	0
			3940	2514	670	740	2	14			
1	C	515	Total	C	N	O	S	Se	0	2	0
			3937	2512	671	738	2	14			
1	D	515	Total	C	N	O	S	Se	0	2	0
			3939	2515	670	738	2	14			
1	E	515	Total	C	N	O	S	Se	0	1	0
			3937	2513	676	732	2	14			
1	F	515	Total	C	N	O	S	Se	0	1	0
			3934	2510	670	738	2	14			

There are 150 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-11	MSE	-	expression tag	UNP Q9WZH5
A	-10	GLY	-	expression tag	UNP Q9WZH5
A	-9	SER	-	expression tag	UNP Q9WZH5
A	-8	ASP	-	expression tag	UNP Q9WZH5
A	-7	LYS	-	expression tag	UNP Q9WZH5
A	-6	ILE	-	expression tag	UNP Q9WZH5
A	-5	HIS	-	expression tag	UNP Q9WZH5
A	-4	HIS	-	expression tag	UNP Q9WZH5
A	-3	HIS	-	expression tag	UNP Q9WZH5
A	-2	HIS	-	expression tag	UNP Q9WZH5
A	-1	HIS	-	expression tag	UNP Q9WZH5
A	0	HIS	-	expression tag	UNP Q9WZH5
A	1	MSE	MET	modified residue	UNP Q9WZH5
A	98	MSE	MET	modified residue	UNP Q9WZH5
A	105	MSE	MET	modified residue	UNP Q9WZH5
A	120	MSE	MET	modified residue	UNP Q9WZH5
A	185	MSE	MET	modified residue	UNP Q9WZH5

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Chain	Residue	Modelled	Actual	Comment	Reference
A	192	MSE	MET	modified residue	UNP Q9WZH5
A	217	MSE	MET	modified residue	UNP Q9WZH5
A	237	MSE	MET	modified residue	UNP Q9WZH5
A	410	MSE	MET	modified residue	UNP Q9WZH5
A	419	MSE	MET	modified residue	UNP Q9WZH5
A	431	MSE	MET	modified residue	UNP Q9WZH5
A	480	MSE	MET	modified residue	UNP Q9WZH5
A	492	MSE	MET	modified residue	UNP Q9WZH5
B	-11	MSE	-	expression tag	UNP Q9WZH5
B	-10	GLY	-	expression tag	UNP Q9WZH5
B	-9	SER	-	expression tag	UNP Q9WZH5
B	-8	ASP	-	expression tag	UNP Q9WZH5
B	-7	LYS	-	expression tag	UNP Q9WZH5
B	-6	ILE	-	expression tag	UNP Q9WZH5
B	-5	HIS	-	expression tag	UNP Q9WZH5
B	-4	HIS	-	expression tag	UNP Q9WZH5
B	-3	HIS	-	expression tag	UNP Q9WZH5
B	-2	HIS	-	expression tag	UNP Q9WZH5
B	-1	HIS	-	expression tag	UNP Q9WZH5
B	0	HIS	-	expression tag	UNP Q9WZH5
B	1	MSE	MET	modified residue	UNP Q9WZH5
B	98	MSE	MET	modified residue	UNP Q9WZH5
B	105	MSE	MET	modified residue	UNP Q9WZH5
B	120	MSE	MET	modified residue	UNP Q9WZH5
B	185	MSE	MET	modified residue	UNP Q9WZH5
B	192	MSE	MET	modified residue	UNP Q9WZH5
B	217	MSE	MET	modified residue	UNP Q9WZH5
B	237	MSE	MET	modified residue	UNP Q9WZH5
B	410	MSE	MET	modified residue	UNP Q9WZH5
B	419	MSE	MET	modified residue	UNP Q9WZH5
B	431	MSE	MET	modified residue	UNP Q9WZH5
B	480	MSE	MET	modified residue	UNP Q9WZH5
B	492	MSE	MET	modified residue	UNP Q9WZH5
C	-11	MSE	-	expression tag	UNP Q9WZH5
C	-10	GLY	-	expression tag	UNP Q9WZH5
C	-9	SER	-	expression tag	UNP Q9WZH5
C	-8	ASP	-	expression tag	UNP Q9WZH5
C	-7	LYS	-	expression tag	UNP Q9WZH5
C	-6	ILE	-	expression tag	UNP Q9WZH5
C	-5	HIS	-	expression tag	UNP Q9WZH5
C	-4	HIS	-	expression tag	UNP Q9WZH5
C	-3	HIS	-	expression tag	UNP Q9WZH5

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-2	HIS	-	expression tag	UNP Q9WZH5
C	-1	HIS	-	expression tag	UNP Q9WZH5
C	0	HIS	-	expression tag	UNP Q9WZH5
C	1	MSE	MET	modified residue	UNP Q9WZH5
C	98	MSE	MET	modified residue	UNP Q9WZH5
C	105	MSE	MET	modified residue	UNP Q9WZH5
C	120	MSE	MET	modified residue	UNP Q9WZH5
C	185	MSE	MET	modified residue	UNP Q9WZH5
C	192	MSE	MET	modified residue	UNP Q9WZH5
C	217	MSE	MET	modified residue	UNP Q9WZH5
C	237	MSE	MET	modified residue	UNP Q9WZH5
C	410	MSE	MET	modified residue	UNP Q9WZH5
C	419	MSE	MET	modified residue	UNP Q9WZH5
C	431	MSE	MET	modified residue	UNP Q9WZH5
C	480	MSE	MET	modified residue	UNP Q9WZH5
C	492	MSE	MET	modified residue	UNP Q9WZH5
D	-11	MSE	-	expression tag	UNP Q9WZH5
D	-10	GLY	-	expression tag	UNP Q9WZH5
D	-9	SER	-	expression tag	UNP Q9WZH5
D	-8	ASP	-	expression tag	UNP Q9WZH5
D	-7	LYS	-	expression tag	UNP Q9WZH5
D	-6	ILE	-	expression tag	UNP Q9WZH5
D	-5	HIS	-	expression tag	UNP Q9WZH5
D	-4	HIS	-	expression tag	UNP Q9WZH5
D	-3	HIS	-	expression tag	UNP Q9WZH5
D	-2	HIS	-	expression tag	UNP Q9WZH5
D	-1	HIS	-	expression tag	UNP Q9WZH5
D	0	HIS	-	expression tag	UNP Q9WZH5
D	1	MSE	MET	modified residue	UNP Q9WZH5
D	98	MSE	MET	modified residue	UNP Q9WZH5
D	105	MSE	MET	modified residue	UNP Q9WZH5
D	120	MSE	MET	modified residue	UNP Q9WZH5
D	185	MSE	MET	modified residue	UNP Q9WZH5
D	192	MSE	MET	modified residue	UNP Q9WZH5
D	217	MSE	MET	modified residue	UNP Q9WZH5
D	237	MSE	MET	modified residue	UNP Q9WZH5
D	410	MSE	MET	modified residue	UNP Q9WZH5
D	419	MSE	MET	modified residue	UNP Q9WZH5
D	431	MSE	MET	modified residue	UNP Q9WZH5
D	480	MSE	MET	modified residue	UNP Q9WZH5
D	492	MSE	MET	modified residue	UNP Q9WZH5
E	-11	MSE	-	expression tag	UNP Q9WZH5

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Chain	Residue	Modelled	Actual	Comment	Reference
E	-10	GLY	-	expression tag	UNP Q9WZH5
E	-9	SER	-	expression tag	UNP Q9WZH5
E	-8	ASP	-	expression tag	UNP Q9WZH5
E	-7	LYS	-	expression tag	UNP Q9WZH5
E	-6	ILE	-	expression tag	UNP Q9WZH5
E	-5	HIS	-	expression tag	UNP Q9WZH5
E	-4	HIS	-	expression tag	UNP Q9WZH5
E	-3	HIS	-	expression tag	UNP Q9WZH5
E	-2	HIS	-	expression tag	UNP Q9WZH5
E	-1	HIS	-	expression tag	UNP Q9WZH5
E	0	HIS	-	expression tag	UNP Q9WZH5
E	1	MSE	MET	modified residue	UNP Q9WZH5
E	98	MSE	MET	modified residue	UNP Q9WZH5
E	105	MSE	MET	modified residue	UNP Q9WZH5
E	120	MSE	MET	modified residue	UNP Q9WZH5
E	185	MSE	MET	modified residue	UNP Q9WZH5
E	192	MSE	MET	modified residue	UNP Q9WZH5
E	217	MSE	MET	modified residue	UNP Q9WZH5
E	237	MSE	MET	modified residue	UNP Q9WZH5
E	410	MSE	MET	modified residue	UNP Q9WZH5
E	419	MSE	MET	modified residue	UNP Q9WZH5
E	431	MSE	MET	modified residue	UNP Q9WZH5
E	480	MSE	MET	modified residue	UNP Q9WZH5
E	492	MSE	MET	modified residue	UNP Q9WZH5
F	-11	MSE	-	expression tag	UNP Q9WZH5
F	-10	GLY	-	expression tag	UNP Q9WZH5
F	-9	SER	-	expression tag	UNP Q9WZH5
F	-8	ASP	-	expression tag	UNP Q9WZH5
F	-7	LYS	-	expression tag	UNP Q9WZH5
F	-6	ILE	-	expression tag	UNP Q9WZH5
F	-5	HIS	-	expression tag	UNP Q9WZH5
F	-4	HIS	-	expression tag	UNP Q9WZH5
F	-3	HIS	-	expression tag	UNP Q9WZH5
F	-2	HIS	-	expression tag	UNP Q9WZH5
F	-1	HIS	-	expression tag	UNP Q9WZH5
F	0	HIS	-	expression tag	UNP Q9WZH5
F	1	MSE	MET	modified residue	UNP Q9WZH5
F	98	MSE	MET	modified residue	UNP Q9WZH5
F	105	MSE	MET	modified residue	UNP Q9WZH5
F	120	MSE	MET	modified residue	UNP Q9WZH5
F	185	MSE	MET	modified residue	UNP Q9WZH5
F	192	MSE	MET	modified residue	UNP Q9WZH5

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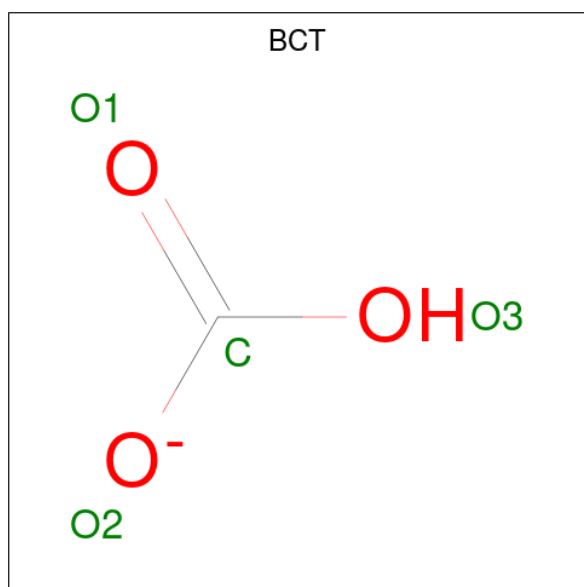
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Chain	Residue	Modelled	Actual	Comment	Reference
F	217	MSE	MET	modified residue	UNP Q9WZH5
F	237	MSE	MET	modified residue	UNP Q9WZH5
F	410	MSE	MET	modified residue	UNP Q9WZH5
F	419	MSE	MET	modified residue	UNP Q9WZH5
F	431	MSE	MET	modified residue	UNP Q9WZH5
F	480	MSE	MET	modified residue	UNP Q9WZH5
F	492	MSE	MET	modified residue	UNP Q9WZH5

- Molecule 2 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total Mg 1 1	0	0
2	B	1	Total Mg 1 1	0	0
2	C	1	Total Mg 1 1	0	0

- Molecule 3 is BICARBONATE ION (CCD ID: BCT) (formula: CHO_3).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 4 1 3	0	0
3	B	1	Total C O 4 1 3	0	0

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	B	1	Total C O 4 1 3	0	0
3	C	1	Total C O 4 1 3	0	0
3	C	1	Total C O 4 1 3	0	0
3	D	1	Total C O 4 1 3	0	0
3	D	1	Total C O 4 1 3	0	0
3	E	1	Total C O 4 1 3	0	0
3	E	1	Total C O 4 1 3	0	0
3	F	1	Total C O 4 1 3	0	0

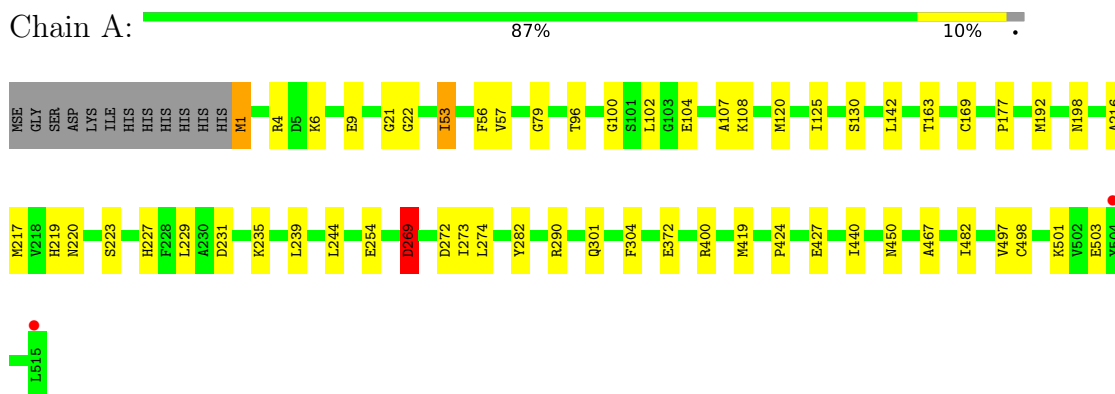
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	239	Total O 239 239	0	0
4	B	258	Total O 258 258	0	0
4	C	219	Total O 219 219	0	0
4	D	235	Total O 235 235	0	0
4	E	266	Total O 266 266	0	0
4	F	222	Total O 222 222	0	0

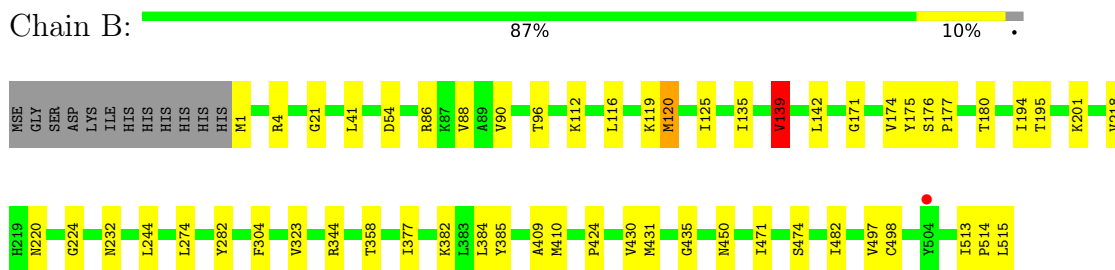
3 Residue-property plots

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.

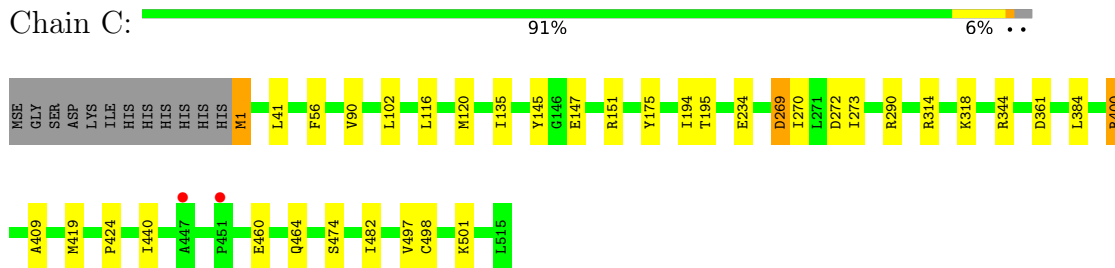
- Molecule 1: propionyl-CoA carboxylase, beta subunit



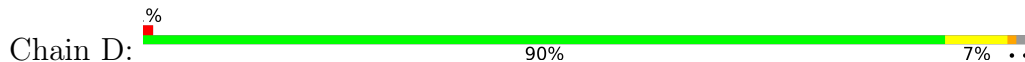
- Molecule 1: propionyl-CoA carboxylase, beta subunit

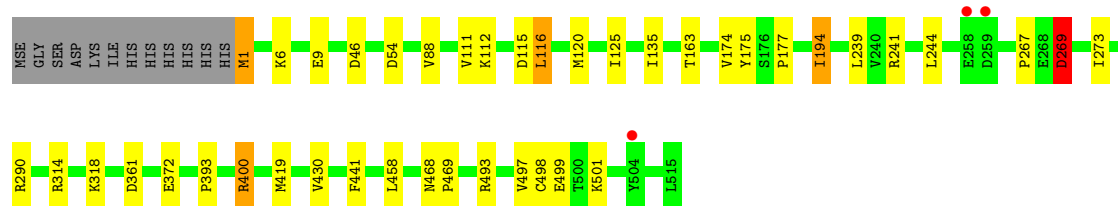


- Molecule 1: propionyl-CoA carboxylase, beta subunit

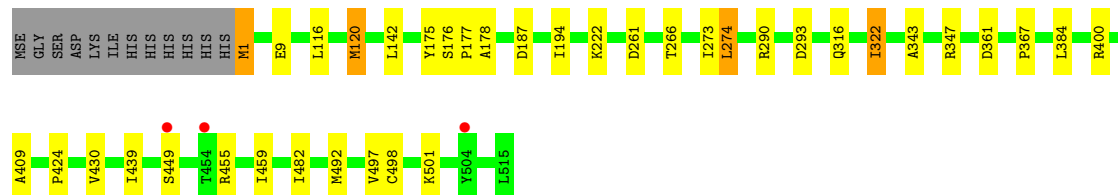
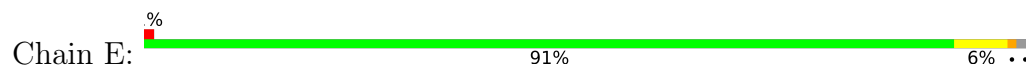


- Molecule 1: propionyl-CoA carboxylase, beta subunit

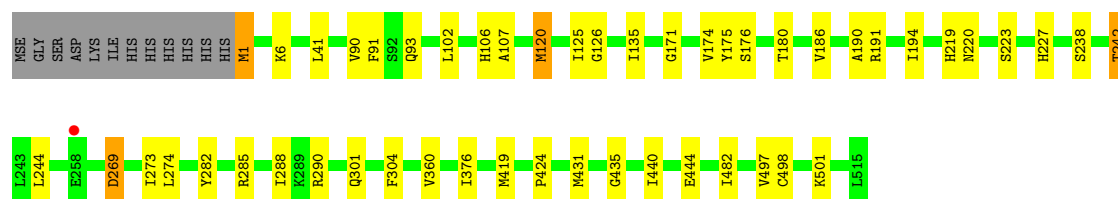
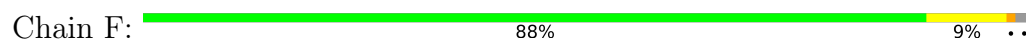




- Molecule 1: propionyl-CoA carboxylase, beta subunit



- Molecule 1: propionyl-CoA carboxylase, beta subunit



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	113.92Å 162.21Å 187.12Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	45.36 – 2.30 45.36 – 2.30	Depositor EDS
% Data completeness (in resolution range)	96.6 (45.36-2.30) 96.5 (45.36-2.30)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.12	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.26 (at 2.29Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.154 , 0.210 0.165 , 0.215	Depositor DCC
R_{free} test set	7428 reflections (4.83%)	wwPDB-VP
Wilson B-factor (Å ²)	28.4	Xtriage
Anisotropy	0.418	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 40.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	25115	wwPDB-VP
Average B, all atoms (Å ²)	32.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.06% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MG, BCT

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	0.90	1/4018 (0.0%)	0.98	4/5425 (0.1%)
1	B	0.90	2/4004 (0.0%)	0.94	4/5405 (0.1%)
1	C	0.84	0/4005	0.93	0/5407
1	D	0.91	1/4007 (0.0%)	0.96	0/5410
1	E	0.90	2/4001 (0.0%)	0.93	1/5399 (0.0%)
1	F	0.88	1/3998 (0.0%)	0.97	1/5398 (0.0%)
All	All	0.89	7/24033 (0.0%)	0.95	10/32444 (0.0%)

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	F	120	MSE	SE-CE	-5.78	1.78	1.95
1	A	217	MSE	SE-CE	5.61	2.12	1.95
1	B	232	ASN	CB-CG	-5.56	1.38	1.52
1	B	120	MSE	SE-CE	-5.37	1.79	1.95
1	D	111	VAL	CA-CB	5.32	1.60	1.54
1	E	120	MSE	SE-CE	-5.08	1.80	1.95
1	E	322	ILE	C-O	-5.06	1.18	1.24

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	360	VAL	N-CA-C	6.09	116.63	107.80
1	B	450	ASN	CA-C-N	5.98	125.86	119.28
1	B	450	ASN	C-N-CA	5.98	125.86	119.28
1	B	139	VAL	CB-CA-C	-5.95	102.94	112.16
1	A	22	GLY	CA-C-N	5.86	125.56	119.05
1	A	22	GLY	C-N-CA	5.86	125.56	119.05
1	A	254	GLU	CA-C-N	-5.83	114.38	120.38
1	A	254	GLU	C-N-CA	-5.83	114.38	120.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	232	ASN	CB-CA-C	-5.30	98.41	110.07
1	E	266	THR	N-CA-C	-5.22	102.05	109.62

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	3946	0	3952	43	0
1	B	3940	0	3949	42	0
1	C	3937	0	3946	32	0
1	D	3939	0	3950	37	0
1	E	3937	0	3967	29	0
1	F	3934	0	3941	34	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
3	A	4	0	0	2	0
3	B	8	0	0	0	0
3	C	8	0	0	0	0
3	D	8	0	0	0	0
3	E	8	0	0	0	0
3	F	4	0	0	0	0
4	A	239	0	0	2	0
4	B	258	0	0	3	0
4	C	219	0	0	3	0
4	D	235	0	0	3	0
4	E	266	0	0	1	0
4	F	222	0	0	1	0
All	All	25115	0	23705	177	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 (177) 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:1[B]:MSE:HE3	4:C:727:HOH:O	1.71	0.90
1:D:120:MSE:HE2	1:E:497:VAL:O	1.82	0.80
1:D:498:CYS:HA	1:F:120:MSE:CE	2.14	0.77
1:E:120:MSE:HE2	1:F:497:VAL:O	1.88	0.74
1:A:498:CYS:HA	1:B:120:MSE:CE	2.20	0.71
1:A:120:MSE:HE2	1:C:497:VAL:O	1.91	0.71
1:A:372:GLU:HG2	4:D:629:HOH:O	1.89	0.71
1:E:120:MSE:CE	1:F:498:CYS:HA	2.21	0.70
1:A:120:MSE:HE3	1:A:120:MSE:HA	1.74	0.70
1:C:120:MSE:HE3	1:C:120:MSE:HA	1.73	0.70
1:E:316:GLN:HG3	1:E:492:MSE:HE3	1.73	0.69
1:B:125:ILE:HD11	1:B:244:LEU:HD11	1.75	0.69
1:D:120:MSE:CE	1:E:498:CYS:HA	2.22	0.68
1:B:498:CYS:HA	1:C:120:MSE:CE	2.23	0.68
1:A:120:MSE:CE	1:C:498:CYS:HA	2.23	0.68
1:E:120:MSE:HE1	1:F:498:CYS:HA	1.76	0.68
1:F:125:ILE:HD11	1:F:244:LEU:HD11	1.77	0.67
1:B:497:VAL:O	1:C:120:MSE:HE2	1.94	0.67
1:D:498:CYS:HA	1:F:120:MSE:HE1	1.76	0.66
1:D:497:VAL:O	1:F:120:MSE:HE2	1.96	0.65
1:A:120:MSE:HE1	1:C:498:CYS:HA	1.77	0.65
1:B:120:MSE:HE3	1:B:120:MSE:HA	1.78	0.65
1:F:238:SER:O	1:F:242:THR:HG23	1.96	0.65
1:A:125:ILE:HD11	1:A:244:LEU:HD11	1.79	0.63
1:F:120:MSE:HE3	1:F:120:MSE:HA	1.81	0.63
1:C:234:GLU:HB2	4:C:676:HOH:O	1.99	0.63
1:B:498:CYS:HA	1:C:120:MSE:HE1	1.81	0.62
1:E:1[B]:MSE:HE1	1:E:9:GLU:OE1	2.00	0.62
1:A:163:THR:HG21	1:A:177:PRO:HA	1.81	0.62
4:A:589:HOH:O	1:D:372:GLU:HG2	1.99	0.62
1:D:120:MSE:HE3	1:D:120:MSE:HA	1.80	0.61
1:E:120:MSE:HE3	1:E:120:MSE:HA	1.83	0.61
1:A:498:CYS:HA	1:B:120:MSE:HE1	1.82	0.60
1:D:120:MSE:HE1	1:E:498:CYS:HA	1.82	0.60
1:E:274:LEU:HD13	1:E:400:ARG:HD3	1.83	0.59
1:A:497:VAL:O	1:B:120:MSE:HE2	2.02	0.59
1:D:1[B]:MSE:HE3	1:D:6:LYS:HG2	1.84	0.58
1:B:220:ASN:O	1:B:304:PHE:HB2	2.03	0.58
1:C:269:ASP:HB3	1:C:290:ARG:HE	1.68	0.57
1:C:460:GLU:O	1:C:464:GLN:HG3	2.05	0.57
1:A:102:LEU:HD21	1:A:107:ALA:HB2	1.87	0.57
1:C:273:ILE:HD11	1:C:290:ARG:HD2	1.87	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:273:ILE:HD11	1:D:290:ARG:HD2	1.87	0.56
1:C:135:ILE:HG22	1:F:440:ILE:HD11	1.87	0.56
1:A:440:ILE:HD11	1:D:135:ILE:HG22	1.86	0.56
1:D:498:CYS:HA	1:F:120:MSE:HE2	1.87	0.55
1:D:115:ASP:OD1	4:D:745:HOH:O	2.18	0.55
1:B:88:VAL:HG11	1:B:125:ILE:HD12	1.89	0.53
1:E:273:ILE:HD11	1:E:290:ARG:HD2	1.90	0.53
1:E:316:GLN:CG	1:E:492:MSE:HE3	2.37	0.53
1:C:384:LEU:HD23	1:C:409:ALA:HA	1.91	0.53
1:B:385:TYR:CD1	1:B:513:ILE:HD12	2.44	0.53
1:B:135:ILE:HD11	1:E:439:ILE:CG2	2.39	0.52
1:D:1[B]:MSE:HE1	1:D:9:GLU:CD	2.34	0.52
1:B:41:LEU:CD2	1:B:90:VAL:HG11	2.39	0.52
1:D:174:VAL:HG21	1:D:194:ILE:HG12	1.92	0.52
1:F:175:TYR:CZ	1:F:194:ILE:HD11	2.45	0.51
1:A:53:ILE:HG13	1:A:79:GLY:HA2	1.91	0.51
1:F:93:GLN:HE21	1:F:106:HIS:HE1	1.59	0.51
1:F:93:GLN:HE21	1:F:106:HIS:CE1	2.29	0.51
1:D:125:ILE:HD11	1:D:244:LEU:HD11	1.93	0.51
1:E:120:MSE:HE1	1:F:501:LYS:N	2.26	0.51
1:D:501:LYS:HB2	1:F:120:MSE:HE1	1.92	0.51
1:D:163:THR:HG21	1:D:177:PRO:HB3	1.93	0.51
1:B:274:LEU:HD22	1:B:282:TYR:CZ	2.46	0.50
1:F:1[B]:MSE:HE3	1:F:6:LYS:HG2	1.93	0.50
1:B:175:TYR:OH	1:B:194:ILE:HD11	2.11	0.50
1:A:274:LEU:HD13	1:A:400:ARG:HD3	1.93	0.50
1:B:431:MSE:HE2	1:B:435:GLY:HA3	1.94	0.50
1:D:120:MSE:HE1	1:E:501:LYS:N	2.27	0.50
1:D:1[A]:MSE:HA	1:D:1[A]:MSE:HE2	1.94	0.49
1:F:102:LEU:HD21	1:F:107:ALA:HB2	1.94	0.49
1:A:450:ASN:OD1	4:A:749:HOH:O	2.20	0.49
1:D:493:ARG:NE	4:D:736:HOH:O	2.42	0.49
1:E:176:SER:HB3	1:E:177:PRO:HD3	1.94	0.49
1:C:424:PRO:HD3	1:C:482:ILE:O	2.13	0.49
1:F:219:HIS:HA	1:F:223:SER:HB2	1.94	0.49
1:C:440:ILE:HD11	1:F:135:ILE:HG22	1.94	0.49
1:A:57:VAL:HA	1:C:474:SER:HA	1.96	0.48
1:B:21:GLY:HA3	1:B:96:THR:O	2.13	0.48
1:A:424:PRO:HD3	1:A:482:ILE:O	2.13	0.48
1:C:419:MSE:HE3	4:C:719:HOH:O	2.12	0.48
1:E:424:PRO:HD3	1:E:482:ILE:O	2.12	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:41:LEU:CD2	1:F:90:VAL:HG11	2.43	0.48
1:B:195:THR:HG21	1:E:367:PRO:HB3	1.95	0.48
1:F:269:ASP:HB3	1:F:290:ARG:HE	1.78	0.48
1:F:273:ILE:HD11	1:F:290:ARG:HD2	1.95	0.48
1:A:198:ASN:HB2	3:A:517:BCT:O1	2.13	0.47
1:B:88:VAL:HG11	1:B:125:ILE:CD1	2.45	0.47
1:B:513:ILE:HG13	1:B:514:PRO:HD2	1.96	0.47
1:A:269:ASP:HB3	1:A:290:ARG:HE	1.80	0.47
1:D:468:ASN:HB2	1:D:469:PRO:HD2	1.97	0.47
1:A:21:GLY:HA3	1:A:96:THR:O	2.14	0.47
1:A:498:CYS:HA	1:B:120:MSE:HE2	1.96	0.47
1:A:501:LYS:N	1:B:120:MSE:HE1	2.30	0.47
1:C:116:LEU:O	1:C:120:MSE:HG2	2.15	0.47
1:F:274:LEU:HD22	1:F:282:TYR:CE1	2.50	0.47
1:A:273:ILE:HD11	1:A:290:ARG:HD2	1.96	0.47
1:A:503:GLU:OE2	1:B:119:LYS:NZ	2.44	0.46
1:D:175:TYR:OH	1:D:194:ILE:HD11	2.14	0.46
1:A:56:PHE:O	1:C:474:SER:HA	2.16	0.46
1:B:424:PRO:HD3	1:B:482:ILE:O	2.14	0.46
1:D:46:ASP:OD1	1:D:241:ARG:NH2	2.40	0.46
1:D:267:PRO:HB2	1:D:269:ASP:HB2	1.96	0.46
1:C:314:ARG:HA	1:C:318:LYS:O	2.16	0.46
1:B:377:ILE:HG22	1:E:178:ALA:HB2	1.97	0.45
1:D:361:ASP:OD1	1:D:400:ARG:HB3	2.15	0.45
1:A:274:LEU:HD22	1:A:282:TYR:CE1	2.51	0.45
1:B:86:ARG:HD2	4:B:582:HOH:O	2.15	0.45
1:C:194:ILE:HG22	1:C:195:THR:HG23	1.98	0.45
1:A:216:ALA:HB1	1:A:229:LEU:CD1	2.46	0.45
1:D:88[B]:VAL:HG11	1:D:125:ILE:HD11	1.97	0.45
1:B:142:LEU:HD11	1:E:430:VAL:HA	1.99	0.45
1:F:171:GLY:O	1:F:174:VAL:HG22	2.17	0.45
1:B:358:THR:CG2	1:B:410:MSE:HE3	2.46	0.45
1:B:430:VAL:HA	1:E:142:LEU:HD11	1.98	0.44
1:D:175:TYR:CZ	1:D:194:ILE:HD11	2.52	0.44
1:A:198:ASN:HB2	3:A:517:BCT:C	2.47	0.44
1:C:361:ASP:CG	1:C:400:ARG:HB3	2.43	0.44
1:A:1[B]:MSE:HE3	1:A:6:LYS:HG2	1.98	0.44
1:B:171:GLY:O	1:B:174:VAL:HG22	2.18	0.44
1:A:427:GLU:HA	1:A:467:ALA:O	2.17	0.44
1:D:54:ASP:OD2	1:D:112:LYS:HD3	2.17	0.44
1:C:270:ILE:HA	1:C:273:ILE:HD12	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:261:ASP:HB3	1:E:293:ASP:CG	2.43	0.43
1:B:139:VAL:HG23	4:B:736:HOH:O	2.16	0.43
1:A:100:GLY:O	1:A:130:SER:OG	2.26	0.43
1:B:384:LEU:HD23	1:B:409:ALA:HA	2.00	0.43
1:B:176:SER:O	1:B:180:THR:HG23	2.18	0.43
1:E:361:ASP:CG	1:E:400:ARG:HB3	2.43	0.43
1:B:176:SER:HB3	1:B:177:PRO:HD3	2.00	0.43
1:B:41:LEU:HD22	1:B:90:VAL:HG11	2.01	0.43
1:B:224:GLY:HA2	4:B:756:HOH:O	2.19	0.42
1:D:116:LEU:O	1:D:120:MSE:HG2	2.18	0.42
1:E:175:TYR:OH	1:E:194:ILE:HD11	2.19	0.42
1:E:384:LEU:HD23	1:E:409:ALA:HA	2.00	0.42
1:F:227:HIS:HA	1:F:301:GLN:HG3	2.01	0.42
1:A:120:MSE:HE1	1:C:501:LYS:N	2.33	0.42
1:A:142:LEU:HD11	1:D:430:VAL:HA	1.99	0.42
1:F:285:ARG:HA	1:F:288:ILE:HD12	2.01	0.42
1:A:104:GLU:OE2	1:A:108:LYS:NZ	2.52	0.42
1:B:54:ASP:OD1	1:B:112:LYS:NZ	2.52	0.42
1:C:175:TYR:CZ	1:C:194:ILE:HD11	2.54	0.42
1:F:376:ILE:HG12	4:F:591:HOH:O	2.19	0.42
1:C:269:ASP:HB3	1:C:290:ARG:NE	2.34	0.42
1:E:343:ALA:O	1:E:347:ARG:HG3	2.20	0.42
1:A:169:CYS:O	1:A:192:MSE:HA	2.19	0.42
1:B:382:LYS:HE2	1:B:515:LEU:HA	2.02	0.42
1:A:1[B]:MSE:HE1	1:A:9:GLU:OE2	2.19	0.42
1:E:222:LYS:NZ	4:E:723:HOH:O	2.52	0.42
1:E:455:ARG:O	1:E:459:ILE:HG13	2.19	0.42
1:F:424:PRO:HD3	1:F:482:ILE:O	2.20	0.42
1:A:120:MSE:HE3	1:A:120:MSE:CA	2.43	0.41
1:D:273:ILE:HD11	1:D:290:ARG:CD	2.50	0.41
1:A:219:HIS:HA	1:A:223:SER:OG	2.21	0.41
1:F:176:SER:O	1:F:180:THR:HG23	2.21	0.41
1:C:147:GLU:O	1:C:151:ARG:HG2	2.21	0.41
1:D:88[B]:VAL:HG11	1:D:125:ILE:CD1	2.50	0.41
1:F:91:PHE:CZ	1:F:126:GLY:HA3	2.55	0.41
1:A:227:HIS:HA	1:A:301:GLN:HG3	2.03	0.41
1:D:441:PHE:HB3	1:D:458:LEU:HD13	2.02	0.41
1:E:116:LEU:O	1:E:120:MSE:HG2	2.20	0.41
1:F:220:ASN:O	1:F:304:PHE:HB2	2.21	0.41
1:A:272:ASP:OD1	1:B:4:ARG:NH2	2.54	0.40
1:D:175:TYR:OH	1:D:194:ILE:CD1	2.69	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:393:PRO:HG3	1:D:498:CYS:HB3	2.02	0.40
1:A:4:ARG:NH2	1:C:272:ASP:OD1	2.52	0.40
1:C:41:LEU:CD2	1:C:90:VAL:HG11	2.51	0.40
1:C:102:LEU:HD13	1:C:145:TYR:CE1	2.56	0.40
1:F:186:VAL:O	1:F:190:ALA:HB3	2.21	0.40
1:A:220:ASN:O	1:A:304:PHE:HB2	2.21	0.40
1:A:235:LYS:O	1:A:239:LEU:HB2	2.20	0.40
1:B:116:LEU:O	1:B:120:MSE:HG2	2.21	0.40
1:B:323:VAL:O	1:B:358:THR:HA	2.22	0.40
1:B:474:SER:HA	1:C:56:PHE:O	2.21	0.40
1:D:314:ARG:HA	1:D:318:LYS:O	2.22	0.40
1:F:431:MSE:HE2	1:F:435:GLY:HA3	2.03	0.40

There are no symmetry-related clashes.

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	515/527 (98%)	501 (97%)	13 (2%)	1 (0%)	43	55
1	B	513/527 (97%)	495 (96%)	18 (4%)	0	100	100
1	C	514/527 (98%)	502 (98%)	10 (2%)	2 (0%)	30	38
1	D	514/527 (98%)	501 (98%)	11 (2%)	2 (0%)	30	38
1	E	513/527 (97%)	498 (97%)	14 (3%)	1 (0%)	43	55
1	F	513/527 (97%)	502 (98%)	10 (2%)	1 (0%)	43	55
All	All	3082/3162 (98%)	2999 (97%)	76 (2%)	7 (0%)	43	55

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	269	ASP

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Mol	Chain	Res	Type
1	D	269	ASP
1	F	269	ASP
1	A	269	ASP
1	E	187	ASP
1	C	400	ARG
1	D	400	ARG

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	413/419 (99%)	407 (98%)	6 (2%)	57	75
1	B	410/419 (98%)	403 (98%)	7 (2%)	53	72
1	C	410/419 (98%)	407 (99%)	3 (1%)	76	87
1	D	410/419 (98%)	402 (98%)	8 (2%)	48	67
1	E	410/419 (98%)	405 (99%)	5 (1%)	63	79
1	F	409/419 (98%)	403 (98%)	6 (2%)	57	75
All	All	2462/2514 (98%)	2427 (99%)	35 (1%)	63	76

All (35) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1[A]	MSE
1	A	1[B]	MSE
1	A	53	ILE
1	A	231	ASP
1	A	269	ASP
1	A	419	MSE
1	B	1[A]	MSE
1	B	1[B]	MSE
1	B	139	VAL
1	B	201	LYS
1	B	218	VAL
1	B	344	ARG

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Mol	Chain	Res	Type
1	B	471	ILE
1	C	1[A]	MSE
1	C	1[B]	MSE
1	C	344	ARG
1	D	1[A]	MSE
1	D	1[B]	MSE
1	D	116	LEU
1	D	194	ILE
1	D	239	LEU
1	D	269	ASP
1	D	419	MSE
1	D	499	GLU
1	E	1[A]	MSE
1	E	1[B]	MSE
1	E	274	LEU
1	E	322	ILE
1	E	449	SER
1	F	1[A]	MSE
1	F	1[B]	MSE
1	F	191	ARG
1	F	242	THR
1	F	419	MSE
1	F	444	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (22) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	152	ASN
1	A	220	ASN
1	A	225	ASN
1	A	450	ASN
1	B	29	GLN
1	B	152	ASN
1	B	198	ASN
1	B	353	ASN
1	C	29	GLN
1	C	128	ASN
1	C	152	ASN
1	C	220	ASN
1	C	353	ASN
1	D	29	GLN
1	D	61	ASN

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Mol	Chain	Res	Type
1	D	152	ASN
1	D	188	GLN
1	D	373	HIS
1	F	106	HIS
1	F	128	ASN
1	F	152	ASN
1	F	220	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](#)

Of 13 ligands modelled in this entry, 3 are monoatomic - leaving 10 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	BCT	D	516	-	3,3,3	0.69	0	2,3,3	0.75	0
3	BCT	E	517	-	3,3,3	0.64	0	2,3,3	0.84	0
3	BCT	B	517	-	3,3,3	0.78	0	2,3,3	0.84	0
3	BCT	A	517	-	3,3,3	0.60	0	2,3,3	0.36	0
3	BCT	D	517	-	3,3,3	0.49	0	2,3,3	0.12	0
3	BCT	E	516	-	3,3,3	0.70	0	2,3,3	0.76	0
3	BCT	B	518	-	3,3,3	0.48	0	2,3,3	0.58	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	BCT	C	517	-	3,3,3	0.59	0	2,3,3	0.92	0
3	BCT	C	518	-	3,3,3	0.49	0	2,3,3	0.54	0
3	BCT	F	516	-	3,3,3	0.61	0	2,3,3	0.29	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	517	BCT	2	0

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	502/527 (95%)	-0.16	2 (0%) 88 89	20, 30, 40, 55	2 (0%)
1	B	502/527 (95%)	-0.16	1 (0%) 91 91	23, 31, 40, 55	0
1	C	502/527 (95%)	0.04	2 (0%) 88 89	17, 30, 40, 54	1 (0%)
1	D	502/527 (95%)	-0.10	3 (0%) 85 86	18, 31, 40, 55	1 (0%)
1	E	502/527 (95%)	-0.13	3 (0%) 85 86	23, 30, 41, 54	0
1	F	502/527 (95%)	-0.05	1 (0%) 91 91	23, 31, 40, 55	0
All	All	3012/3162 (95%)	-0.09	12 (0%) 88 89	17, 30, 40, 55	4 (0%)

All (12) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	504	TYR	3.3
1	C	447	ALA	2.7
1	D	504	TYR	2.6
1	A	515	LEU	2.6
1	E	454	THR	2.6
1	D	259	ASP	2.5
1	E	504	TYR	2.5
1	C	451	PRO	2.5
1	B	504	TYR	2.3
1	E	449	SER	2.3
1	F	258	GLU	2.3
1	D	258	GLU	2.1

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](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	BCT	D	517	4/4	0.75	0.20	67,67,69,70	0
3	BCT	F	516	4/4	0.76	0.15	60,61,62,65	0
3	BCT	D	516	4/4	0.78	0.15	53,54,55,56	0
3	BCT	C	518	4/4	0.79	0.14	57,58,59,60	0
3	BCT	B	517	4/4	0.80	0.14	46,47,51,51	0
3	BCT	E	517	4/4	0.81	0.14	36,43,45,46	0
3	BCT	C	517	4/4	0.82	0.13	51,52,52,56	0
3	BCT	E	516	4/4	0.82	0.15	44,44,47,53	0
3	BCT	B	518	4/4	0.83	0.13	53,53,54,54	0
3	BCT	A	517	4/4	0.89	0.10	45,46,46,48	0
2	MG	A	516	1/1	0.99	0.07	23,23,23,23	0
2	MG	C	516	1/1	0.99	0.09	24,24,24,24	0
2	MG	B	516	1/1	1.00	0.08	18,18,18,18	0

6.5 Other polymers [i](#)

There are no such residues in this entry.