



Full wwPDB X-ray Structure Validation Report ⓘ

Sep 14, 2023 – 07:05 AM EDT

PDB ID : 1VRG
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.

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
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.35.1
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) : 2.35.1

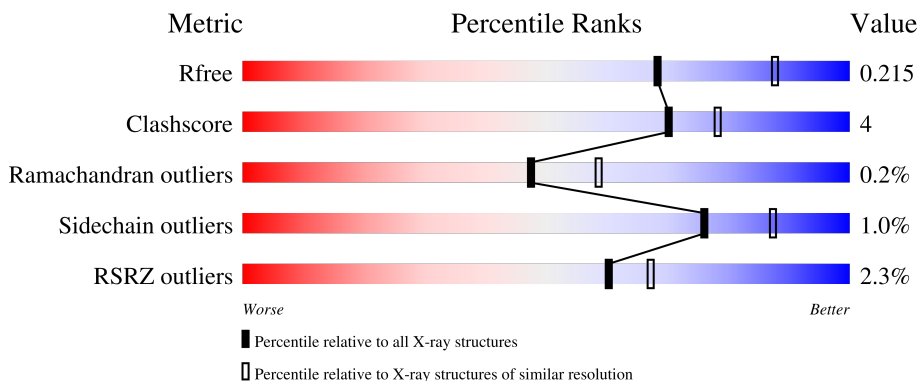
1 Overall quality at a glance

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	527	
1	B	527	
1	C	527	
1	D	527	
1	E	527	

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Mol	Chain	Length	Quality of chain
1	F	527	

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 [i](#)

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

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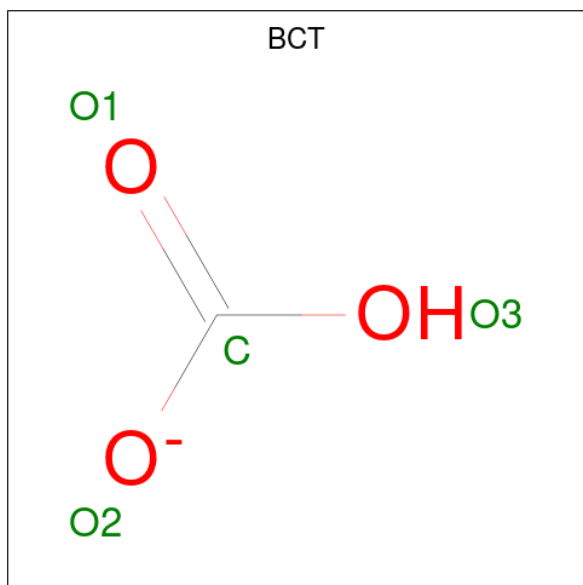
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Chain	Residue	Modelled	Actual	Comment	Reference
F	217	MSE	MET	modified residue	UNP Q9WZH5
F	237	MSE	MET	modified residue	UNP Q9WZH5
F	410	MSE	MET	modified residue	UNP Q9WZH5
F	419	MSE	MET	modified residue	UNP Q9WZH5
F	431	MSE	MET	modified residue	UNP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

- Molecule 2 is MAGNESIUM ION (three-letter code: 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 (three-letter code: BCT) (formula: CHO₃).



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 4	C 1	O 3	0	0
3	C	1	Total 4	C 1	O 3	0	0
3	C	1	Total 4	C 1	O 3	0	0
3	D	1	Total 4	C 1	O 3	0	0
3	D	1	Total 4	C 1	O 3	0	0
3	E	1	Total 4	C 1	O 3	0	0
3	E	1	Total 4	C 1	O 3	0	0
3	F	1	Total 4	C 1	O 3	0	0

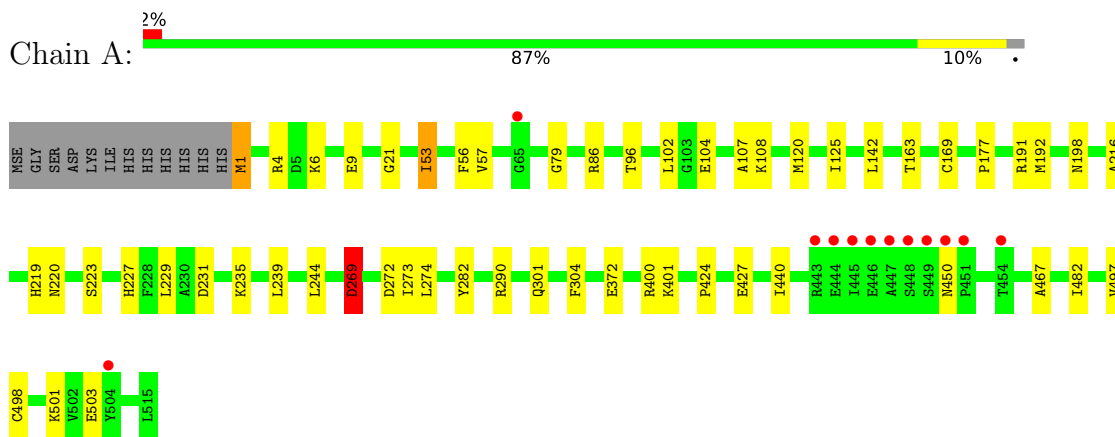
- Molecule 4 is water.

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

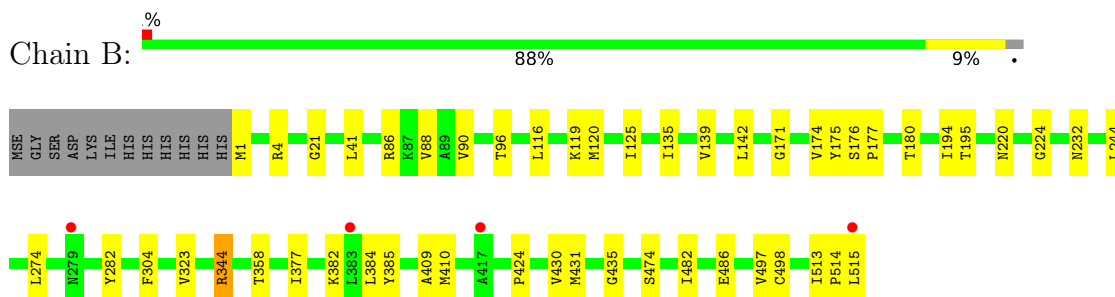
3 Residue-property plots [i](#)

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.

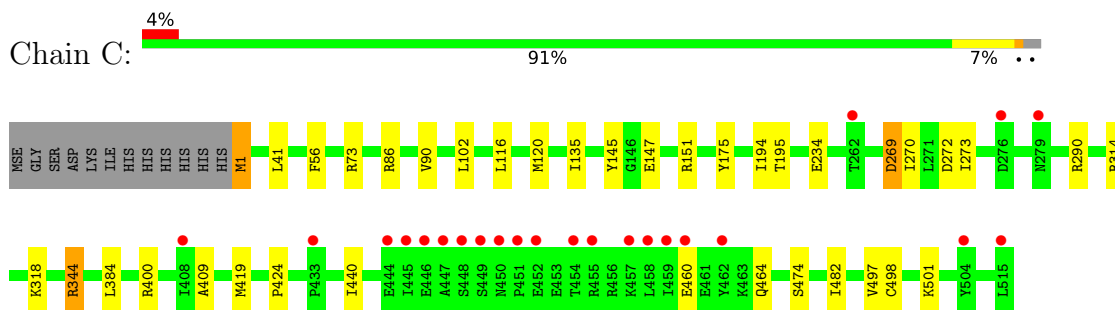
- Molecule 1: propionyl-CoA carboxylase, beta subunit



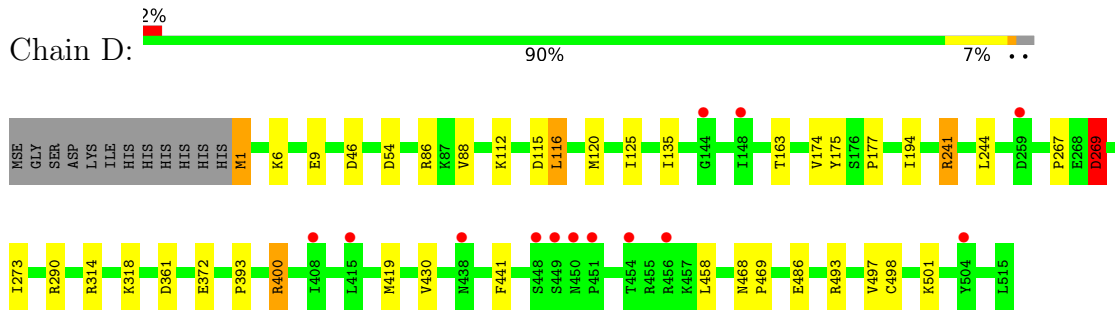
- Molecule 1: propionyl-CoA carboxylase, beta subunit



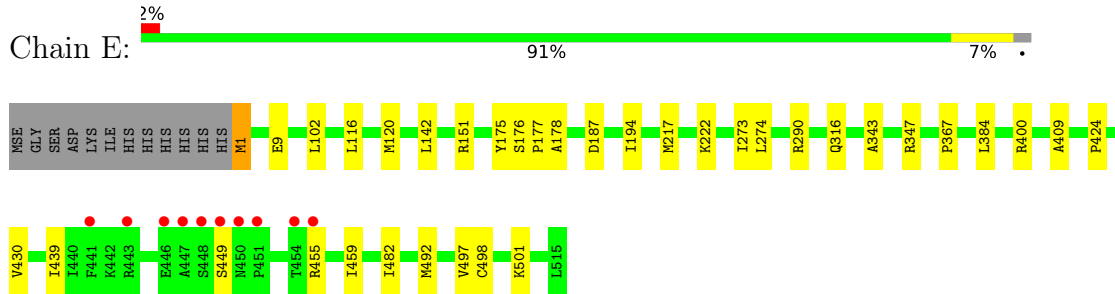
- Molecule 1: propionyl-CoA carboxylase, beta subunit



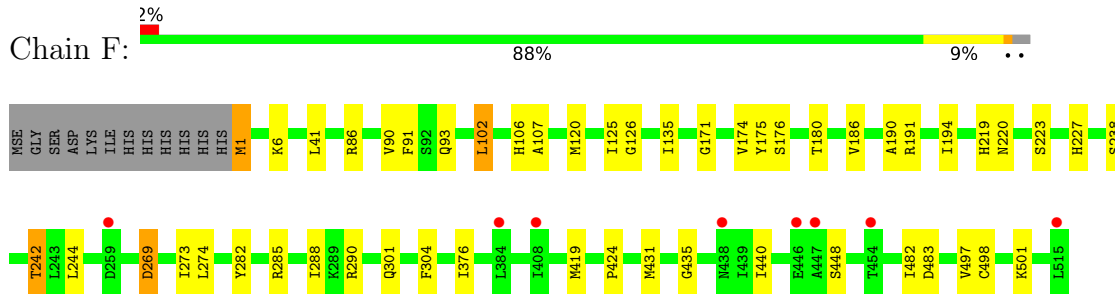
- Molecule 1: propionyl-CoA carboxylase, beta subunit



- 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) 96.6 (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)	Xtrriage
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 (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	28.4	Xtrriage
Anisotropy	0.418	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 42.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	25115	wwPDB-VP
Average B, all atoms (Å ²)	32.0	wwPDB-VP

Xtrriage'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 [i](#)

5.1 Standard geometry [i](#)

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	0.69	0/4018	0.76	2/5425 (0.0%)
1	B	0.70	2/4004 (0.0%)	0.74	3/5405 (0.1%)
1	C	0.64	0/4005	0.72	4/5407 (0.1%)
1	D	0.71	1/4007 (0.0%)	0.76	4/5410 (0.1%)
1	E	0.70	0/4001	0.73	0/5399
1	F	0.66	0/3998	0.74	3/5398 (0.1%)
All	All	0.69	3/24033 (0.0%)	0.74	16/32444 (0.0%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	486	GLU	CG-CD	6.03	1.60	1.51
1	B	232	ASN	CB-CG	-5.61	1.38	1.51
1	D	486	GLU	CG-CD	5.47	1.60	1.51

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	344	ARG	NE-CZ-NH1	9.61	125.10	120.30
1	D	241	ARG	NE-CZ-NH1	8.42	124.51	120.30
1	C	344	ARG	NE-CZ-NH2	-8.39	116.11	120.30
1	B	344	ARG	NE-CZ-NH2	-7.96	116.32	120.30
1	D	241	ARG	NE-CZ-NH2	-7.32	116.64	120.30
1	C	344	ARG	NE-CZ-NH1	7.21	123.91	120.30
1	A	86	ARG	NE-CZ-NH2	-6.90	116.85	120.30
1	D	86	ARG	NE-CZ-NH2	-6.03	117.28	120.30
1	B	232	ASN	CB-CA-C	-6.00	98.41	110.40
1	A	86	ARG	NE-CZ-NH1	5.96	123.28	120.30
1	F	483	ASP	CB-CG-OD1	5.62	123.36	118.30
1	C	73	ARG	NE-CZ-NH1	5.50	123.05	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	86	ARG	NE-CZ-NH1	5.47	123.03	120.30
1	C	86	ARG	NE-CZ-NH1	5.45	123.03	120.30
1	F	86	ARG	NE-CZ-NH2	-5.25	117.67	120.30
1	F	86	ARG	NE-CZ-NH1	5.20	122.90	120.30

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	42	0
1	B	3940	0	3949	41	0
1	C	3937	0	3946	31	0
1	D	3939	0	3950	37	0
1	E	3937	0	3967	27	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	172	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 (172) 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

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
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
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: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

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:424:PRO:HD3	1:E:482:ILE:O	2.12	0.48
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:D:1[B]:MSE:HE1	1:D:9:GLU:CD	2.34	0.47
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: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

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:270:ILE:HA	1:C:273:ILE:HD12	2.00	0.44
1:B:139:VAL:HG23	4:B:736:HOH:O	2.16	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: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: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
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

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
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 [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	515/527 (98%)	501 (97%)	13 (2%)	1 (0%)	47	58
1	B	513/527 (97%)	495 (96%)	18 (4%)	0	100	100
1	C	514/527 (98%)	502 (98%)	10 (2%)	2 (0%)	34	42
1	D	514/527 (98%)	501 (98%)	11 (2%)	2 (0%)	34	42
1	E	513/527 (97%)	498 (97%)	14 (3%)	1 (0%)	47	58
1	F	513/527 (97%)	502 (98%)	10 (2%)	1 (0%)	47	58
All	All	3082/3162 (98%)	2999 (97%)	76 (2%)	7 (0%)	47	58

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	269	ASP
1	D	269	ASP
1	F	269	ASP

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

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	413/419 (99%)	406 (98%)	7 (2%)	60	76
1	B	410/419 (98%)	407 (99%)	3 (1%)	84	92
1	C	410/419 (98%)	407 (99%)	3 (1%)	84	92
1	D	410/419 (98%)	405 (99%)	5 (1%)	71	84
1	E	410/419 (98%)	404 (98%)	6 (2%)	65	79
1	F	409/419 (98%)	402 (98%)	7 (2%)	60	76
All	All	2462/2514 (98%)	2431 (99%)	31 (1%)	76	82

All (31) 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	191	ARG
1	A	231	ASP
1	A	269	ASP
1	A	401	LYS
1	B	1[A]	MSE
1	B	1[B]	MSE
1	B	344	ARG
1	C	1[A]	MSE
1	C	1[B]	MSE
1	C	344	ARG
1	D	1[A]	MSE

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Mol	Chain	Res	Type
1	D	1[B]	MSE
1	D	116	LEU
1	D	269	ASP
1	D	419	MSE
1	E	1[A]	MSE
1	E	1[B]	MSE
1	E	102	LEU
1	E	151	ARG
1	E	217	MSE
1	E	449	SER
1	F	1[A]	MSE
1	F	1[B]	MSE
1	F	102	LEU
1	F	191	ARG
1	F	242	THR
1	F	419	MSE
1	F	448	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	19	GLN
1	C	128	ASN
1	D	128	ASN
1	F	106	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 monosaccharides 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	B	518	-	2,3,3	0.60	0	2,3,3	0.60	0
3	BCT	E	517	-	2,3,3	0.65	0	2,3,3	0.86	0
3	BCT	C	518	-	2,3,3	0.60	0	2,3,3	0.53	0
3	BCT	B	517	-	2,3,3	0.72	0	2,3,3	0.80	0
3	BCT	D	517	-	2,3,3	0.56	0	2,3,3	0.17	0
3	BCT	C	517	-	2,3,3	0.73	0	2,3,3	0.94	0
3	BCT	A	517	-	2,3,3	0.74	0	2,3,3	0.40	0
3	BCT	E	516	-	2,3,3	0.85	0	2,3,3	0.79	0
3	BCT	D	516	-	2,3,3	0.83	0	2,3,3	0.76	0
3	BCT	F	516	-	2,3,3	0.69	0	2,3,3	0.25	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

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	502/527 (95%)	-0.15	12 (2%) 59 66	23, 30, 40, 55	0
1	B	502/527 (95%)	-0.21	4 (0%) 86 89	23, 31, 40, 55	0
1	C	502/527 (95%)	0.03	23 (4%) 32 39	23, 30, 40, 54	0
1	D	502/527 (95%)	-0.04	13 (2%) 56 63	23, 31, 40, 55	0
1	E	502/527 (95%)	-0.12	10 (1%) 65 71	23, 30, 41, 54	0
1	F	502/527 (95%)	-0.09	8 (1%) 72 77	23, 31, 40, 55	0
All	All	3012/3162 (95%)	-0.10	70 (2%) 60 67	23, 30, 40, 55	0

All (70) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	447	ALA	5.9
1	C	447	ALA	5.6
1	C	445	ILE	5.6
1	C	449	SER	5.1
1	C	448	SER	4.8
1	E	449	SER	4.8
1	C	451	PRO	4.5
1	A	451	PRO	4.4
1	E	447	ALA	4.3
1	C	446	GLU	4.2
1	E	454	THR	4.2
1	E	448	SER	4.1
1	A	449	SER	4.0
1	C	515	LEU	3.9
1	C	450	ASN	3.8
1	A	450	ASN	3.5
1	C	455	ARG	3.4
1	E	450	ASN	3.4
1	A	445	ILE	3.3

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Mol	Chain	Res	Type	RSRZ
1	E	451	PRO	3.3
1	A	448	SER	3.3
1	C	454	THR	3.0
1	C	460	GLU	2.9
1	A	454	THR	2.9
1	B	515	LEU	2.9
1	D	450	ASN	2.9
1	A	446	GLU	2.8
1	C	444	GLU	2.8
1	E	446	GLU	2.8
1	D	448	SER	2.8
1	A	65	GLY	2.7
1	B	383	LEU	2.6
1	C	262	THR	2.6
1	D	449	SER	2.5
1	E	441	PHE	2.5
1	D	504	TYR	2.5
1	B	417	ALA	2.5
1	A	444	GLU	2.5
1	A	504	TYR	2.5
1	D	259	ASP	2.4
1	C	462	TYR	2.4
1	F	259	ASP	2.4
1	F	446	GLU	2.4
1	C	452	GLU	2.4
1	D	454	THR	2.3
1	F	384	LEU	2.3
1	D	148	ILE	2.3
1	F	408	ILE	2.3
1	C	459	ILE	2.2
1	D	408	ILE	2.2
1	D	438	ASN	2.2
1	C	408	ILE	2.2
1	D	456	ARG	2.2
1	F	454	THR	2.2
1	D	144	GLY	2.2
1	E	455	ARG	2.1
1	C	458	LEU	2.1
1	D	451	PRO	2.1
1	F	515	LEU	2.1
1	A	443	ARG	2.1
1	C	504	TYR	2.1

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Mol	Chain	Res	Type	RSRZ
1	D	415	LEU	2.1
1	C	279	ASN	2.1
1	C	457	LYS	2.1
1	C	433	PRO	2.0
1	E	443	ARG	2.0
1	B	279	ASN	2.0
1	F	438	ASN	2.0
1	C	276	ASP	2.0
1	F	447	ALA	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](#)

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(Å ²)	Q<0.9
3	BCT	D	517	4/4	0.63	0.20	67,67,69,70	0
3	BCT	F	516	4/4	0.82	0.21	60,61,62,65	0
3	BCT	E	517	4/4	0.85	0.20	36,43,45,46	0
3	BCT	E	516	4/4	0.87	0.14	44,44,47,53	0
3	BCT	D	516	4/4	0.89	0.12	53,54,55,56	0
3	BCT	B	517	4/4	0.91	0.16	46,47,51,51	0
3	BCT	C	517	4/4	0.92	0.13	51,52,52,56	0
3	BCT	B	518	4/4	0.92	0.19	53,53,54,54	0
3	BCT	C	518	4/4	0.93	0.17	57,58,59,60	0
3	BCT	A	517	4/4	0.93	0.10	45,46,46,48	0
2	MG	B	516	1/1	0.98	0.04	18,18,18,18	0
2	MG	C	516	1/1	0.98	0.04	24,24,24,24	0
2	MG	A	516	1/1	0.99	0.02	23,23,23,23	0

6.5 Other polymers [i](#)

There are no such residues in this entry.