



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2018 – 01:01 pm GMT

PDB ID : 4FAA
Title : Structure of Recombinant Cytochrome ba3 Oxidase mutant A120F+A204F from *Thermus thermophilus*
Authors : Li, Y.; Chen, Y.; Stout, C.D.
Deposited on : 2012-05-21
Resolution : 2.80 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.7.3 (157068), CSD as539be (2018)
Xtriage (Phenix) : 1.13
EDS : trunk30967
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)
Refmac : 5.8.0158
CCP4 : 7.0 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk30967

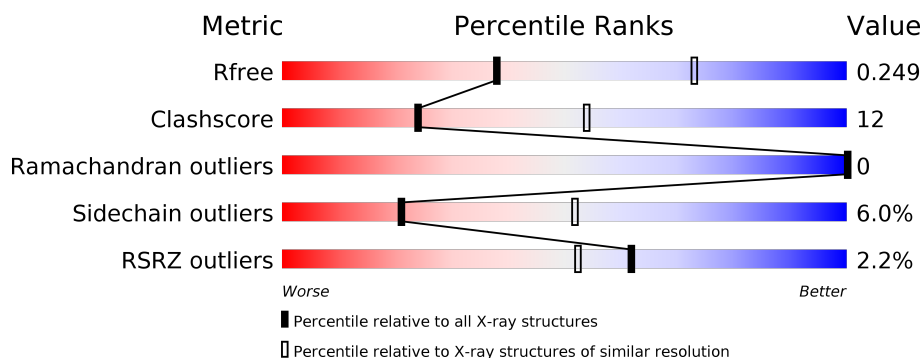
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 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}	111664	2792 (2.80-2.80)
Clashscore	122126	3209 (2.80-2.80)
Ramachandran outliers	120053	3158 (2.80-2.80)
Sidechain outliers	120020	3160 (2.80-2.80)
RSRZ outliers	108989	2726 (2.80-2.80)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	568	<div> <div>2%</div> <div> <div></div> <div>69%</div> <div>23%</div> <div>6%</div> </div> </div>
2	B	168	<div> <div>%</div> <div> <div></div> <div>74%</div> <div>22%</div> <div>•</div> </div> </div>
3	C	34	<div> <div></div> <div> <div></div> <div>53%</div> <div>35%</div> <div>•</div> <div>9%</div> </div> </div>

2 Entry composition

There are 10 unique types of molecules in this entry. The entry contains 6278 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 Cytochrome c oxidase subunit 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	535	Total	C	N	O	S	0	0	0
			4203	2863	663	661	16			

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-5	MET	-	EXPRESSION TAG	UNP Q5SJ79
A	-4	HIS	-	EXPRESSION TAG	UNP Q5SJ79
A	-3	HIS	-	EXPRESSION TAG	UNP Q5SJ79
A	-2	HIS	-	EXPRESSION TAG	UNP Q5SJ79
A	-1	HIS	-	EXPRESSION TAG	UNP Q5SJ79
A	0	HIS	-	EXPRESSION TAG	UNP Q5SJ79
A	1	HIS	-	EXPRESSION TAG	UNP Q5SJ79
A	120	PHE	ALA	ENGINEERED MUTATION	UNP Q5SJ79
A	204	PHE	ALA	ENGINEERED MUTATION	UNP Q5SJ79

- Molecule 2 is a protein called Cytochrome c oxidase subunit 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	166	Total	C	N	O	S	0	0	0
			1281	833	212	232	4			

- Molecule 3 is a protein called Cytochrome c oxidase polypeptide 2A.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	C	31	Total	C	N	O	0	0	0
			241	169	37	35			

- Molecule 4 is COPPER (II) ION (three-letter code: CU) (formula: Cu).

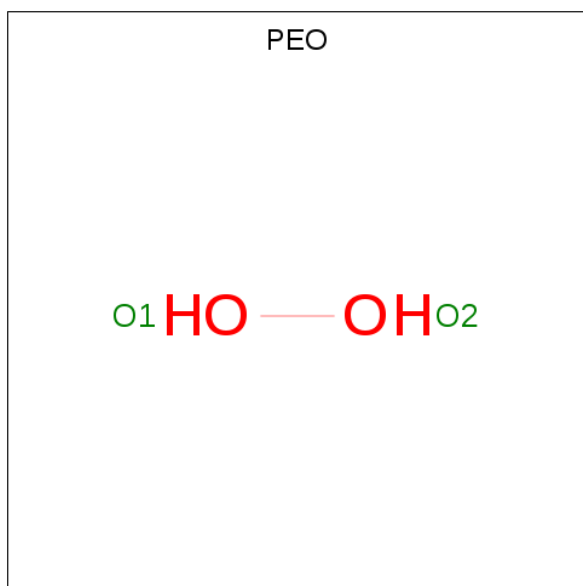
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Cu	0	0
			1	1		

- Molecule 5 is PROTOPORPHYRIN IX CONTAINING FE (three-letter code: HEM) (formula: $C_{34}H_{32}FeN_4O_4$).



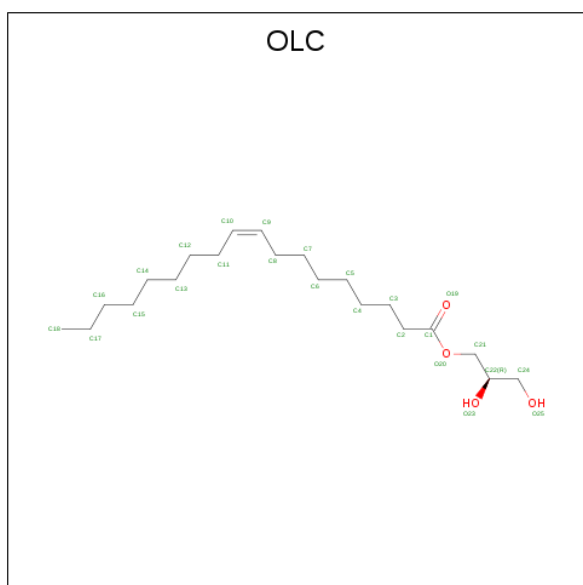
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	A	1	Total	C	Fe	N	O	
			65	54	1	4	6	

- Molecule 7 is HYDROGEN PEROXIDE (three-letter code: PEO) (formula: H_2O_2).



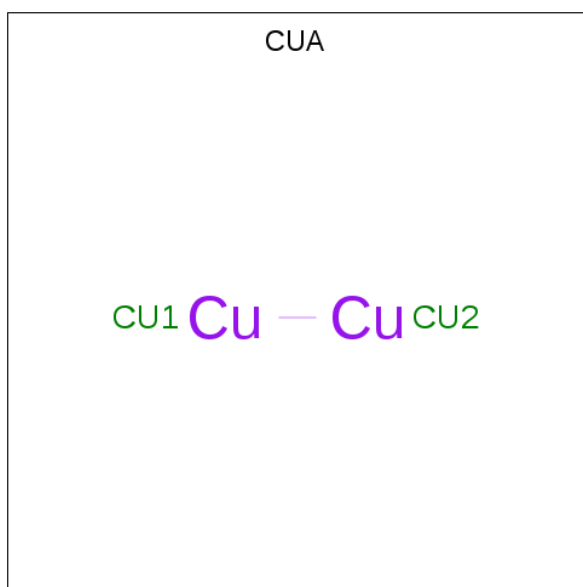
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	1	Total	O		
			2	2	0	0

- Molecule 8 is (2R)-2,3-dihydroxypropyl (9Z)-octadec-9-enoate (three-letter code: OLC) (formula: $\text{C}_{21}\text{H}_{40}\text{O}_4$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	A	1	Total	C	O	0	0
			25	21	4		
8	A	1	Total	C	O	0	0
			25	21	4		
8	A	1	Total	C	O	0	0
			23	19	4		
8	A	1	Total	C	O	0	0
			21	19	2		
8	A	1	Total	C	O	0	0
			18	14	4		
8	A	1	Total	C	O	0	0
			17	13	4		
8	A	1	Total	C	O	0	0
			8	4	4		
8	A	1	Total	C	O	0	0
			15	11	4		
8	A	1	Total	C	O	0	0
			20	16	4		
8	A	1	Total	C	O	0	0
			25	21	4		
8	A	1	Total	C	O	0	0
			21	17	4		
8	A	1	Total	C	O	0	0
			25	21	4		
8	B	1	Total	C	O	0	0
			25	21	4		
8	B	1	Total	C	O	0	0
			25	21	4		
8	B	1	Total	C	O	0	0
			25	21	4		
8	C	1	Total	C	O	0	0
			25	21	4		

- Molecule 9 is DINUCLEAR COPPER ION (three-letter code: CUA) (formula: Cu₂).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	B	1	Total Cu 2 2	0	0

- Molecule 10 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
10	A	51	Total O 51 51	0	0
10	B	44	Total O 44 44	0	0
10	C	2	Total O 2 2	0	0

4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	143.28Å 98.29Å 95.05Å 90.00° 127.50° 90.00°	Depositor
Resolution (Å)	56.84 – 2.80 56.84 – 2.80	Depositor EDS
% Data completeness (in resolution range)	97.2 (56.84-2.80) 97.3 (56.84-2.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.65 (at 2.81Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 2011_01_25_1225)	Depositor
R, R_{free}	0.194 , 0.254 0.190 , 0.249	Depositor DCC
R_{free} test set	1289 reflections (5.12%)	wwPDB-VP
Wilson B-factor (Å ²)	37.1	Xtriage
Anisotropy	0.192	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 61.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	6278	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 6.54% 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: OLC, PEO, CUA, HEM, HAS, CU

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	0/4356	0.57	2/5982 (0.0%)
2	B	0.53	0/1317	0.58	0/1801
3	C	0.48	0/247	0.52	0/335
All	All	0.51	0/5920	0.57	2/8118 (0.0%)

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
2	B	0	1

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	131	VAL	N-CA-C	-5.83	95.26	111.00
1	A	369	PHE	N-CA-CB	-5.34	100.98	110.60

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	B	48	GLY	Peptide

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	4203	0	4278	108	0
2	B	1281	0	1249	27	0
3	C	241	0	267	9	0
4	A	1	0	0	0	0
5	A	43	0	30	0	0
6	A	65	0	62	2	0
7	A	2	0	0	0	0
8	A	243	0	353	28	0
8	B	75	0	120	10	0
8	C	25	0	40	3	0
9	B	2	0	0	0	0
10	A	51	0	0	4	0
10	B	44	0	0	2	2
10	C	2	0	0	0	0
All	All	6278	0	6399	150	2

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 12.

The worst 5 of 150 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:233:HIS:NE2	1:A:237:TYR:HE2	1.26	1.30
1:A:233:HIS:NE2	1:A:237:TYR:CE2	2.10	1.19
1:A:233:HIS:CD2	1:A:237:TYR:HE2	1.76	1.04
1:A:174:ASN:HB3	1:A:177:LYS:HD2	1.49	0.94
2:B:51:GLU:OE2	10:B:309:HOH:O	1.89	0.90

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
10:B:330:HOH:O	10:B:330:HOH:O[2_554]	1.94	0.26
10:B:308:HOH:O	10:B:324:HOH:O[2_554]	2.08	0.12

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	529/568 (93%)	489 (92%)	40 (8%)	0	100	100
2	B	164/168 (98%)	154 (94%)	10 (6%)	0	100	100
3	C	29/34 (85%)	24 (83%)	5 (17%)	0	100	100
All	All	722/770 (94%)	667 (92%)	55 (8%)	0	100	100

There are no Ramachandran outliers to report.

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	428/464 (92%)	407 (95%)	21 (5%)	27	60
2	B	132/138 (96%)	123 (93%)	9 (7%)	17	45
3	C	24/27 (89%)	19 (79%)	5 (21%)	1	3
All	All	584/629 (93%)	549 (94%)	35 (6%)	21	52

5 of 35 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	452	TYR
1	A	518	ARG
3	C	13	LEU
1	A	472	LEU
1	A	475	ILE

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	122	ASN
2	B	157	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

5.6 Ligand geometry ⓘ

Of 21 ligands modelled in this entry, 1 is monoatomic - leaving 20 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	$\# Z > 2$
5	HEM	A	602	1	27,50,50	3.17	12 (44%)	17,82,82	1.71	5 (29%)
6	HAS	A	603	1,7	56,72,72	4.20	14 (25%)	49,109,109	2.32	13 (26%)
7	PEO	A	604	4,6	1,1,1	0.60	0	0,0,0	0.00	-
8	OLC	A	605	-	24,24,24	0.48	0	25,25,25	0.81	0
8	OLC	A	606	-	24,24,24	0.49	0	25,25,25	0.85	0
8	OLC	A	607	-	22,22,24	0.53	0	23,23,25	0.51	0
8	OLC	A	608	-	20,20,24	0.56	0	20,20,25	0.62	0
8	OLC	A	609	-	17,17,24	0.65	1 (5%)	18,18,25	0.78	0
8	OLC	A	610	-	16,16,24	0.77	1 (6%)	17,17,25	0.92	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
8	OLC	A	611	-	7,7,24	0.53	0	6,7,25	0.19	0
8	OLC	A	612	-	14,14,24	0.56	0	15,15,25	0.76	0
8	OLC	A	613	-	19,19,24	0.67	1 (5%)	20,20,25	0.74	0
8	OLC	A	614	-	24,24,24	0.57	1 (4%)	25,25,25	0.80	0
8	OLC	A	615	-	20,20,24	0.51	0	21,21,25	0.73	0
8	OLC	A	616	-	24,24,24	0.55	1 (4%)	25,25,25	0.63	0
9	CUA	B	201	2	0,1,1	0.00	-	0,0,0	0.00	-
8	OLC	B	202	-	24,24,24	0.62	1 (4%)	25,25,25	0.73	1 (4%)
8	OLC	B	203	-	24,24,24	0.57	1 (4%)	25,25,25	0.90	2 (8%)
8	OLC	B	204	-	24,24,24	0.49	0	25,25,25	0.66	0
8	OLC	C	101	-	24,24,24	0.52	0	25,25,25	0.58	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	HEM	A	602	1	-	0/6/54/54	0/0/8/8
6	HAS	A	603	1,7	-	0/35/122/122	0/0/8/8
7	PEO	A	604	4,6	-	0/0/0/0	0/0/0/0
8	OLC	A	605	-	-	0/24/24/24	0/0/0/0
8	OLC	A	606	-	-	0/24/24/24	0/0/0/0
8	OLC	A	607	-	-	0/22/22/24	0/0/0/0
8	OLC	A	608	-	-	0/19/19/24	0/0/0/0
8	OLC	A	609	-	-	0/17/17/24	0/0/0/0
8	OLC	A	610	-	-	0/16/16/24	0/0/0/0
8	OLC	A	611	-	-	0/6/6/24	0/0/0/0
8	OLC	A	612	-	-	0/14/14/24	0/0/0/0
8	OLC	A	613	-	-	0/19/19/24	0/0/0/0
8	OLC	A	614	-	-	0/24/24/24	0/0/0/0
8	OLC	A	615	-	-	0/20/20/24	0/0/0/0
8	OLC	A	616	-	-	0/24/24/24	0/0/0/0
9	CUA	B	201	2	-	0/0/0/0	0/0/0/0
8	OLC	B	202	-	-	0/24/24/24	0/0/0/0
8	OLC	B	203	-	-	0/24/24/24	0/0/0/0
8	OLC	B	204	-	-	0/24/24/24	0/0/0/0
8	OLC	C	101	-	-	0/24/24/24	0/0/0/0

The worst 5 of 33 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	603	HAS	CHD-C4A	-18.04	1.32	1.51
6	A	603	HAS	C1B-NB	-10.45	1.34	1.49
6	A	603	HAS	CHC-C4B	-9.64	1.34	1.53
6	A	603	HAS	C4B-NB	-8.57	1.37	1.49
5	A	602	HEM	C3B-CAB	-7.90	1.32	1.47

The worst 5 of 22 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	603	HAS	CHD-C4A-C3A	-4.93	121.29	129.53
5	A	602	HEM	C3B-C4B-NB	-3.34	104.90	109.21
6	A	603	HAS	CAA-C2A-C1A	-3.25	125.02	127.30
6	A	603	HAS	CHD-C4C-C3C	-2.99	125.69	129.61
6	A	603	HAS	CAD-CBD-CGD	-2.98	107.57	112.66

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

14 monomers are involved in 36 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	603	HAS	2	0
8	A	605	OLC	8	0
8	A	606	OLC	4	0
8	A	607	OLC	1	0
8	A	608	OLC	1	0
8	A	609	OLC	1	0
8	A	611	OLC	3	0
8	A	612	OLC	2	0
8	A	613	OLC	3	0
8	A	614	OLC	3	0
8	A	616	OLC	4	0
8	B	202	OLC	2	0
8	B	203	OLC	8	0
8	C	101	OLC	3	0

5.7 Other polymers ⓘ

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 [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	535/568 (94%)	-0.32	14 (2%) 56 45	21, 29, 49, 77	1 (0%)
2	B	166/168 (98%)	-0.38	2 (1%) 79 72	22, 30, 46, 68	0
3	C	31/34 (91%)	-0.59	0 100 100	23, 28, 37, 49	0
All	All	732/770 (95%)	-0.34	16 (2%) 62 52	21, 29, 48, 77	1 (0%)

The worst 5 of 16 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	513	SER	4.7
1	A	322	PHE	3.6
1	A	60	PRO	3.1
1	A	14	ALA	3.1
1	A	13	GLU	2.9

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no carbohydrates in this entry.

6.4 Ligands [i](#)

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(\AA^2)	Q<0.9
8	OLC	A	610	17/25	0.64	0.31	39,50,74,74	0
8	OLC	B	203	25/25	0.69	0.31	41,53,74,85	0
8	OLC	A	613	20/25	0.73	0.32	39,49,65,66	0
8	OLC	A	606	25/25	0.76	0.26	34,43,82,92	0
8	OLC	A	608	21/25	0.76	0.30	38,50,58,66	0
8	OLC	B	204	25/25	0.76	0.30	35,46,73,78	0
8	OLC	A	612	15/25	0.80	0.52	47,59,73,74	0
8	OLC	C	101	25/25	0.80	0.24	39,61,77,81	0
8	OLC	B	202	25/25	0.81	0.22	31,39,56,62	0
8	OLC	A	616	25/25	0.81	0.29	38,49,56,58	0
8	OLC	A	615	21/25	0.82	0.25	39,51,65,73	0
8	OLC	A	605	25/25	0.82	0.26	27,44,64,71	0
8	OLC	A	614	25/25	0.82	0.26	38,45,54,61	0
8	OLC	A	609	18/25	0.83	0.23	30,47,69,69	0
8	OLC	A	607	23/25	0.88	0.21	34,40,53,56	0
8	OLC	A	611	8/25	0.88	0.27	45,47,54,57	0
6	HAS	A	603	65/65	0.96	0.16	17,23,34,39	0
5	HEM	A	602	43/43	0.96	0.14	18,23,26,31	0
4	CU	A	601	1/1	0.99	0.12	25,25,25,25	0
9	CUA	B	201	2/2	0.99	0.11	21,21,21,24	0
7	PEO	A	604	2/2	0.99	0.12	19,19,19,25	0

6.5 Other polymers [i](#)

There are no such residues in this entry.