wwPDB X-ray Structure Validation Summary Report (i)

Feb 15, 2024 – 09:08 AM EST

PDB ID	:	3PF7
Title	:	Crystal structure of BoxB with malonate bound to the diiron center
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Deposited on	:	2010-10-28
Resolution	:	1.90 Å(reported)

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

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the (i) 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 (1)) were used in the production of this report:

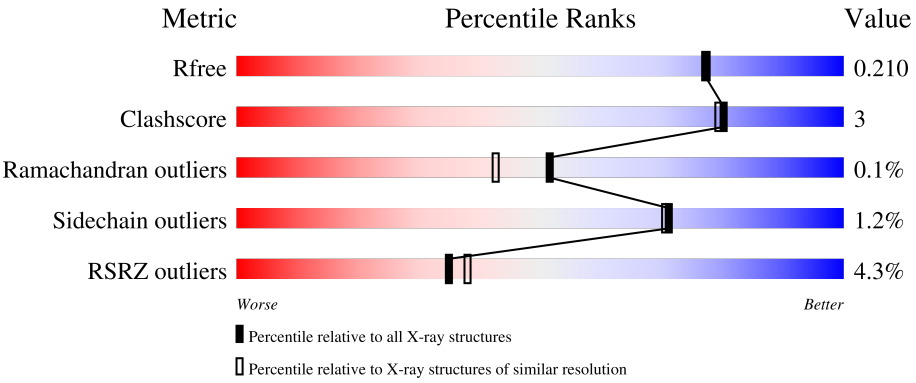
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	6207 (1.90-1.90)
Clashscore	141614	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)
RSRZ outliers	127900	6082 (1.90-1.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=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	481	2% 91% 7%
1	B	481	7% 92% 6%

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 16474 atoms, of which 7604 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 Benzoyl-CoA oxygenase component B.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	477	Total	C	H	N	O	S	0	14	0
			7830	2522	3852	714	729	13			
1	B	470	Total	C	H	N	O	S	0	9	0
			7626	2460	3748	692	714	12			

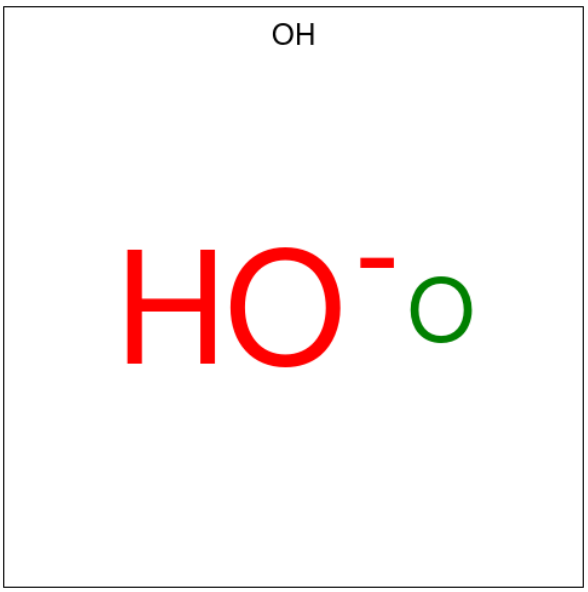
There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	474	TRP	-	SEE REMARK 999	UNP Q9AIX7
A	475	SER	-	SEE REMARK 999	UNP Q9AIX7
A	476	HIS	-	SEE REMARK 999	UNP Q9AIX7
A	477	PRO	-	SEE REMARK 999	UNP Q9AIX7
A	478	GLN	-	SEE REMARK 999	UNP Q9AIX7
A	479	PHE	-	SEE REMARK 999	UNP Q9AIX7
A	480	GLU	-	SEE REMARK 999	UNP Q9AIX7
A	481	LYS	-	SEE REMARK 999	UNP Q9AIX7
B	474	TRP	-	SEE REMARK 999	UNP Q9AIX7
B	475	SER	-	SEE REMARK 999	UNP Q9AIX7
B	476	HIS	-	SEE REMARK 999	UNP Q9AIX7
B	477	PRO	-	SEE REMARK 999	UNP Q9AIX7
B	478	GLN	-	SEE REMARK 999	UNP Q9AIX7
B	479	PHE	-	SEE REMARK 999	UNP Q9AIX7
B	480	GLU	-	SEE REMARK 999	UNP Q9AIX7
B	481	LYS	-	SEE REMARK 999	UNP Q9AIX7

- Molecule 2 is FE (III) ION (three-letter code: FE) (formula: Fe).

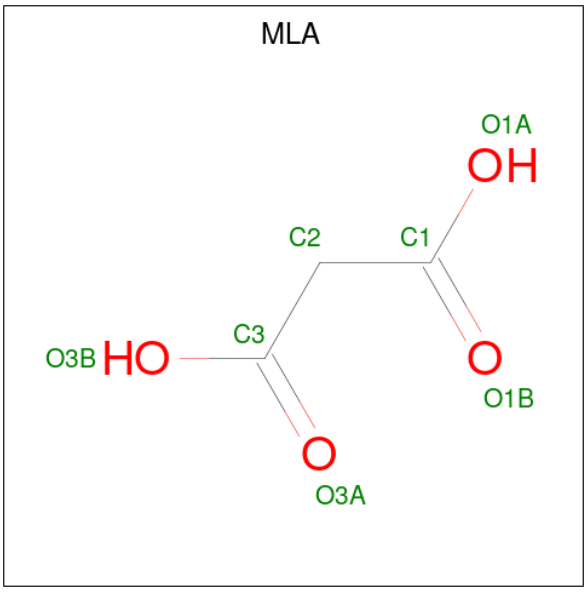
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	2	Total	Fe	0	0
			2	2		
2	B	2	Total	Fe	0	0
			2	2		

- Molecule 3 is HYDROXIDE ION (three-letter code: OH) (formula: HO).



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

- Molecule 4 is MALONIC ACID (three-letter code: MLA) (formula: $C_3H_4O_4$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C H O 9 3 2 4	0	0

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	1	Total C H O 9 3 2 4	0	0

- Molecule 5 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total Cl 1 1	0	0

- Molecule 6 is water.

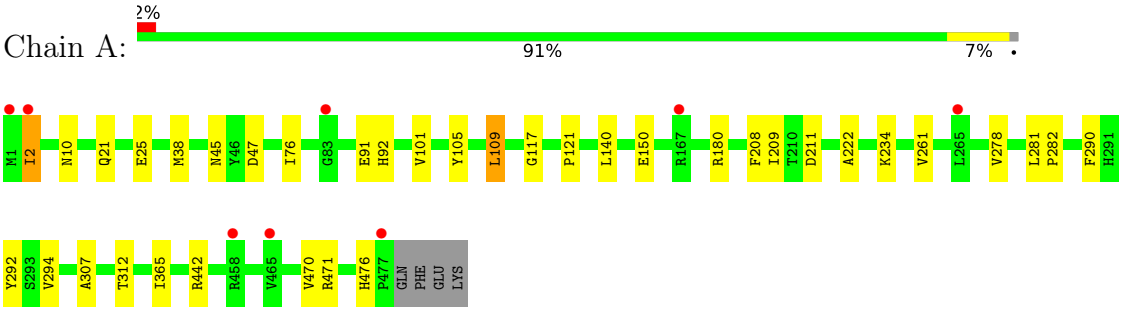
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	535	Total O 535 535	0	0
6	B	458	Total O 458 458	0	0

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.

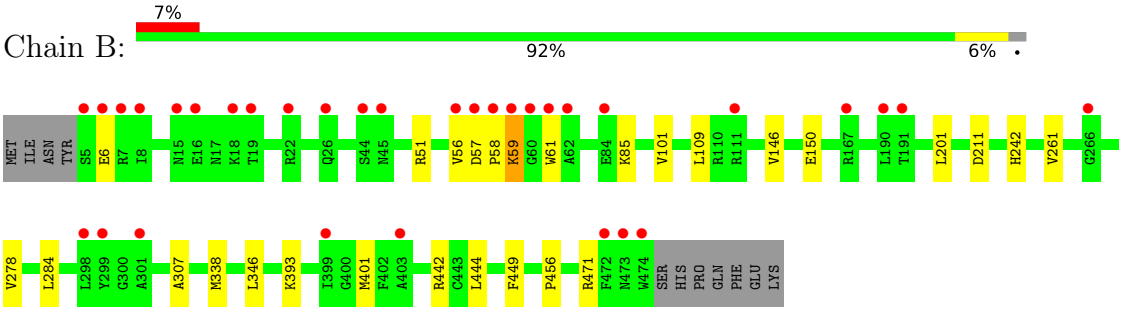
• Molecule 1: Benzoyl-CoA oxygenase component B

Chain A:



• Molecule 1: Benzoyl-CoA oxygenase component B

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α, β, γ	112.79Å 213.49Å 137.19Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.86 – 1.90 46.86 – 1.90	Depositor EDS
% Data completeness (in resolution range)	94.4 (46.86-1.90) 94.6 (46.86-1.90)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	0.09	Depositor
$< I/\sigma(I) >$ [1]	4.72 (at 1.91Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.6.4_486)	Depositor
R, R_{free}	0.182 , 0.217 0.178 , 0.210	Depositor DCC
R_{free} test set	6106 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	20.1	Xtriage
Anisotropy	0.607	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.42 , 54.0	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	16474	wwPDB-VP
Average B, all atoms (Å^2)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.04% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: OH, MLA, CL, FE

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	0.44	0/4137	0.54	0/5605
1	B	0.41	0/4010	0.52	0/5433
All	All	0.43	0/8147	0.53	0/11038

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

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	3978	3852	3800	23	0
1	B	3878	3748	3726	18	0
2	A	2	0	0	0	0
2	B	2	0	0	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	7	2	2	0	0
4	B	7	2	2	0	0
5	A	1	0	0	0	0
6	A	535	0	0	2	0
6	B	458	0	0	5	0
All	All	8870	7604	7530	41	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 3.

The worst 5 of 41 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:180[B]:ARG:HH11	1:A:180[B]:ARG:HG3	1.48	0.79
1:B:442:ARG:HD2	1:B:444:LEU:HD11	1.81	0.62
1:A:180[B]:ARG:HH11	1:A:180[B]:ARG:CG	2.15	0.58
1:B:307:ALA:HB3	6:B:573:HOH:O	2.03	0.58
1:A:307:ALA:HB3	6:A:531:HOH:O	2.04	0.57

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	489/481 (102%)	483 (99%)	6 (1%)	0	100	100
1	B	477/481 (99%)	469 (98%)	7 (2%)	1 (0%)	47	38
All	All	966/962 (100%)	952 (99%)	13 (1%)	1 (0%)	51	42

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	58	PRO

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	425/415 (102%)	421 (99%)	4 (1%)	78 79
1	B	411/415 (99%)	405 (98%)	6 (2%)	65 62
All	All	836/830 (101%)	826 (99%)	10 (1%)	71 70

5 of 10 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	109	LEU
1	B	211	ASP
1	B	346	LEU
1	A	442	ARG
1	B	6	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 6 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	461	ASN
1	B	21	GLN
1	B	162	HIS
1	A	92	HIS
1	A	81	GLN

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 9 ligands modelled in this entry, 5 are monoatomic and 2 are modelled with single atom - leaving 2 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	$\#\|Z\| > 2$
4	MLA	A	1004	2	6,6,6	1.24	0	7,7,7	0.94	0
4	MLA	B	1004	2	6,6,6	1.21	0	7,7,7	1.43	1 (14%)

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
4	MLA	A	1004	2	-	0/4/4/4	-
4	MLA	B	1004	2	-	2/4/4/4	-

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	B	1004	MLA	O1A-C1-C2	2.42	122.27	114.54

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	B	1004	MLA	C1-C2-C3-O3A
4	B	1004	MLA	C1-C2-C3-O3B

There are no ring outliers.

No monomer is involved in short contacts.

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, 95^{th} 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	477/481 (99%)	0.10	8 (1%) 70 72	15, 23, 44, 81	0
1	B	470/481 (97%)	0.31	33 (7%) 16 18	16, 26, 51, 130	0
All	All	947/962 (98%)	0.20	41 (4%) 35 38	15, 25, 48, 130	0

The worst 5 of 41 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	58	PRO	7.6
1	B	61	TRP	6.3
1	B	474	TRP	6.2
1	B	60	GLY	6.1
1	B	59	LYS	5.0

6.2 Non-standard residues in protein, DNA, RNA chains

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

6.3 Carbohydrates

There are no monosaccharides in this entry.

6.4 Ligands

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, 95^{th} 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
4	MLA	A	1004	7/7	0.94	0.15	23,29,39,39	0
4	MLA	B	1004	7/7	0.94	0.15	26,31,37,38	0
5	CL	A	482	1/1	0.94	0.06	44,44,44,44	0
3	OH	B	1003	1/1	0.98	0.13	18,18,18,18	0
2	FE	B	1002	1/1	0.99	0.09	24,24,24,24	0
3	OH	A	1003	1/1	0.99	0.12	17,17,17,17	0
2	FE	A	1001	1/1	1.00	0.11	19,19,19,19	0
2	FE	A	1002	1/1	1.00	0.11	19,19,19,19	0
2	FE	B	1001	1/1	1.00	0.09	21,21,21,21	0

6.5 Other polymers (i)

There are no such residues in this entry.