



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 20, 2023 – 04:08 PM JST

PDB ID : 7D8T  
Title : MITF bHLHLZ complex with M-box DNA  
Authors : Guo, M.; Fang, P.; Wang, J.  
Deposited on : 2020-10-09  
Resolution : 3.20 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](mailto: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>.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Xtriage (Phenix) : 1.13  
EDS : 2.35.1  
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

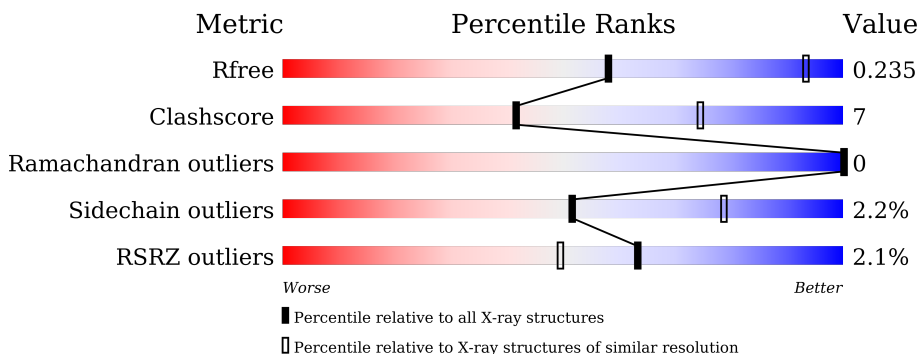
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.20 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	1133 (3.20-3.20)
Clashscore	141614	1253 (3.20-3.20)
Ramachandran outliers	138981	1234 (3.20-3.20)
Sidechain outliers	138945	1233 (3.20-3.20)
RSRZ outliers	127900	1095 (3.20-3.20)

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  $\geq 3$ , 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	C	16	 6% 62% 38%
2	D	16	 50% 44% 6%
3	A	199	 2% 87% 13%
3	B	199	 2% 85% 14%

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 3599 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 DNA chain called DNA (5'-D(P\*GP\*GP\*GP\*AP\*CP\*AP\*CP\*AP\*TP\*GP\*TP\*TP\*AP\*CP\*AP\*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
1	C	16	329	157	65	92	15	0	0	0

- Molecule 2 is a DNA chain called DNA (5'-D(\*TP\*GP\*TP\*AP\*AP\*CP\*AP\*TP\*GP\*TP\*GP\*TP\*CP\*CP\*CP\*C)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
2	D	16	321	155	55	96	15	0	0	0

- Molecule 3 is a protein called Microphthalmia-associated transcription factor, Methionyl-tRNA synthetase beta subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	A	199	1490	940	276	272	2	0	0	0
3	B	199	1459	919	268	270	2	0	0	0

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	305	SER	-	expression tag	UNP O75030
A	385	CYS	ASN	engineered mutation	UNP O75030
A	500	ALA	-	expression tag	UNP O66738
A	501	ALA	-	expression tag	UNP O66738
A	502	LEU	-	expression tag	UNP O66738
A	503	GLU	-	expression tag	UNP O66738
B	305	SER	-	expression tag	UNP O75030
B	385	CYS	ASN	engineered mutation	UNP O75030
B	500	ALA	-	expression tag	UNP O66738

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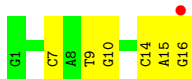
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Chain	Residue	Modelled	Actual	Comment	Reference
B	501	ALA	-	expression tag	UNP O66738
B	502	LEU	-	expression tag	UNP O66738
B	503	GLU	-	expression tag	UNP O66738

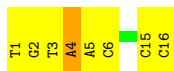
### 3 Residue-property plots [i](#)

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.

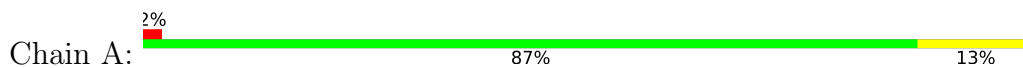
- Molecule 1: DNA (5'-D(P\*GP\*GP\*GP\*AP\*CP\*AP\*CP\*AP\*TP\*GP\*TP\*TP\*AP\*CP\*AP\*G)-3')



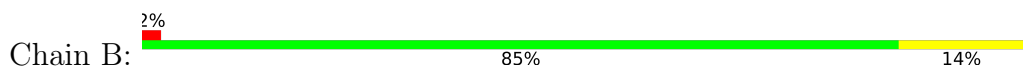
- Molecule 2: DNA (5'-D(\*TP\*GP\*TP\*AP\*AP\*CP\*AP\*TP\*GP\*TP\*GP\*TP\*CP\*CP\*CP\*C)-3')



- Molecule 3: Microphthalmia-associated transcription factor, Methionyl-tRNA synthetase beta subunit



- Molecule 3: Microphthalmia-associated transcription factor, Methionyl-tRNA synthetase beta subunit



## 4 Data and refinement statistics

Property	Value	Source
Space group	H 3 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	207.26Å 207.26Å 163.16Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	19.79 – 3.20 48.16 – 3.20	Depositor EDS
% Data completeness (in resolution range)	89.3 (19.79-3.20) 89.6 (48.16-3.20)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.13	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.64 (at 3.19Å)	Xtrriage
Refinement program	PHENIX 1.13_2998	Depositor
R, $R_{free}$	0.204 , 0.234 0.206 , 0.235	Depositor DCC
$R_{free}$ test set	1016 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	82.1	Xtrriage
Anisotropy	0.048	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.29 , 59.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.88	EDS
Total number of atoms	3599	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	95.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.97% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 5$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
1	C	0.77	0/370	0.89	0/570
2	D	0.99	2/358 (0.6%)	1.05	0/550
3	A	0.29	0/1505	0.48	0/2033
3	B	0.29	0/1474	0.44	0/1998
All	All	0.47	2/3707 (0.1%)	0.61	0/5151

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	4	DA	C4'-O4'	-8.93	1.36	1.45
2	D	5	DA	C2'-C1'	-7.69	1.44	1.52

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	C	329	0	181	9	0
2	D	321	0	183	10	0
3	A	1490	0	1475	15	0
3	B	1459	0	1413	20	0
All	All	3599	0	3252	46	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 7.

All (46) 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:15:DA:H2''	1:C:16:DG:O5'	1.70	0.90
1:C:15:DA:C2'	1:C:16:DG:O5'	2.26	0.84
3:A:454:ILE:HD13	3:A:485:VAL:HB	1.72	0.70
2:D:6:DC:OP2	3:B:323:ARG:NH2	2.27	0.68
3:B:456:ILE:HG22	3:B:474:ILE:HA	1.74	0.67
1:C:16:DG:O6	2:D:1:DT:N3	2.20	0.67
3:B:402:LYS:O	3:B:459:ASN:ND2	2.28	0.66
3:A:434:ARG:NH1	3:A:458:ALA:O	2.23	0.65
2:D:6:DC:N4	3:B:320:GLU:OE1	2.27	0.65
3:A:437:VAL:HG11	3:A:465:ILE:HD11	1.81	0.63
1:C:14:DC:H4'	1:C:15:DA:O5'	2.01	0.60
3:B:454:ILE:HD12	3:B:474:ILE:HD13	1.85	0.59
3:A:411:LEU:HD11	3:A:428:SER:HB2	1.86	0.57
3:B:431:ASP:OD1	3:B:432:GLU:N	2.37	0.57
2:D:15:DC:C3'	2:D:16:DC:H5''	2.34	0.56
3:A:338:ILE:HD11	3:A:357:SER:HA	1.88	0.56
2:D:15:DC:H3'	2:D:16:DC:H5''	1.87	0.56
3:A:333:GLU:OE2	3:B:358:VAL:HG11	2.06	0.56
1:C:7:DC:OP2	3:B:324:ARG:NH1	2.34	0.55
3:B:403:VAL:HA	3:B:459:ASN:HD21	1.73	0.54
2:D:3:DT:H2'	2:D:4:DA:C8	2.44	0.53
3:B:502:LEU:H	3:B:502:LEU:HD23	1.73	0.53
3:B:425:LEU:HD12	3:B:427:LEU:HD21	1.90	0.52
3:A:330:ARG:O	3:A:334:LEU:N	2.37	0.47
3:B:405:LEU:HD22	3:B:475:LEU:HD11	1.95	0.47
2:D:15:DC:C2'	2:D:16:DC:H5''	2.45	0.47
3:A:454:ILE:HD12	3:A:486:ILE:O	2.15	0.47
3:B:410:VAL:HG11	3:B:449:LEU:HD13	1.96	0.46
1:C:15:DA:N6	2:D:3:DT:H1'	2.31	0.46
3:A:445:THR:OG1	3:A:448:GLU:HG3	2.15	0.46
2:D:1:DT:H2'	2:D:2:DG:C8	2.52	0.45
3:A:475:LEU:HD23	3:A:475:LEU:HA	1.82	0.45
3:A:453:LYS:NZ	3:A:492:VAL:O	2.44	0.45
3:B:459:ASN:OD1	3:B:459:ASN:N	2.43	0.45
1:C:9:DT:H2''	1:C:10:DG:C8	2.52	0.45
3:A:348:TRP:HA	3:A:348:TRP:CE3	2.53	0.44
3:A:333:GLU:O	3:A:336:THR:OG1	2.35	0.43
1:C:15:DA:C6	2:D:3:DT:H1'	2.54	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:B:343:ASP:O	3:B:345:ASP:N	2.50	0.42
3:B:390:LEU:HD12	3:B:390:LEU:HA	1.84	0.42
3:B:362:ARG:O	3:B:366:ARG:HG3	2.19	0.42
3:B:430:GLY:N	3:B:494:GLU:OE1	2.52	0.42
3:A:381:LEU:HD11	3:B:385:CYS:SG	2.60	0.42
1:C:15:DA:H2'	1:C:16:DG:C8	2.55	0.41
3:B:411:LEU:HD11	3:B:428:SER:HB3	2.02	0.41
3:A:381:LEU:HD23	3:A:381:LEU:HA	1.74	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	
3	A	197/199 (99%)	191 (97%)	6 (3%)	0	100	100
3	B	197/199 (99%)	188 (95%)	9 (5%)	0	100	100
All	All	394/398 (99%)	379 (96%)	15 (4%)	0	100	100

There are no Ramachandran outliers to report.

### 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	
3	A	142/174 (82%)	139 (98%)	3 (2%)	53	79

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
3	B	137/174 (79%)	134 (98%)	3 (2%)	52	79
All	All	279/348 (80%)	273 (98%)	6 (2%)	52	79

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	A	310	ARG
3	A	322	ARG
3	A	370	ARG
3	B	425	LEU
3	B	479	ASP
3	B	494	GLU

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

Mol	Chain	Res	Type
3	B	369	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](#)

There are no ligands in this entry.

## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues

There are no chain breaks in this entry.

## 6 Fit of model and data [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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	C	16/16 (100%)	0.87	1 (6%) 20 11	83, 109, 128, 153	0
2	D	16/16 (100%)	0.40	0 100 100	85, 98, 113, 115	0
3	A	199/199 (100%)	0.08	4 (2%) 65 51	48, 83, 134, 179	0
3	B	199/199 (100%)	-0.08	4 (2%) 65 51	51, 98, 167, 203	0
All	All	430/430 (100%)	0.04	9 (2%) 63 49	48, 92, 154, 203	0

All (9) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	16	DG	4.9
3	B	319	ILE	3.0
3	A	342	ASN	2.8
3	A	345	ASP	2.6
3	B	317	ASN	2.5
3	A	346	MET	2.4
3	A	344	PRO	2.3
3	B	315	ASN	2.2
3	B	316	HIS	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 monosaccharides in this entry.

## 6.4 Ligands

There are no ligands in this entry.

## 6.5 Other polymers

There are no such residues in this entry.