Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 01:40 PM GMT

PDB ID	:	3ULL
Title	:	HUMAN MITOCHONDRIAL SINGLE-STRANDED DNA BINDING PROTEIN
Authors	:	Yang, C.; Curth, U.; Urbanke, C.; Kang, C.
Deposited on	:	1996-12-11
Resolution	:	2.40 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
http://wwpdb.org/validation/2016/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:

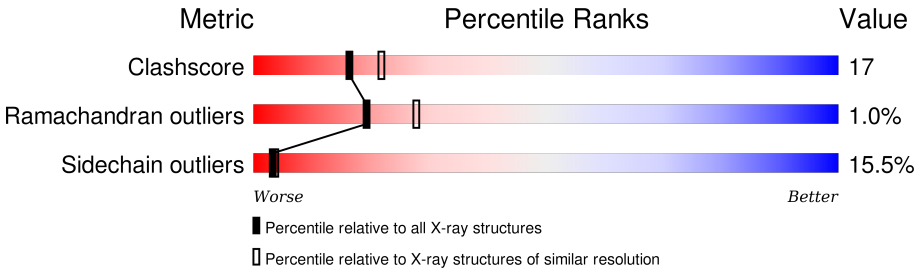
MolProbity	:	4.02b-467
Mogul	:	1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	trunk26865

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 2.40 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))
Clashscore	102246	3407 (2.40-2.40)
Ramachandran outliers	100387	3351 (2.40-2.40)
Sidechain outliers	100360	3352 (2.40-2.40)

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 <=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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	132	45% 23% 11% • 20%
1	B	132	47% 21% 8% • 22%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 1756 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 DNA BINDING PROTEIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	106	Total	C	N	O	S	0	0	0
			871	551	162	156	2			
1	B	103	Total	C	N	O	S	0	0	0
			847	537	158	150	2			

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	19	Total	O	0	0
			19	19		
2	B	19	Total	O	0	0
			19	19		

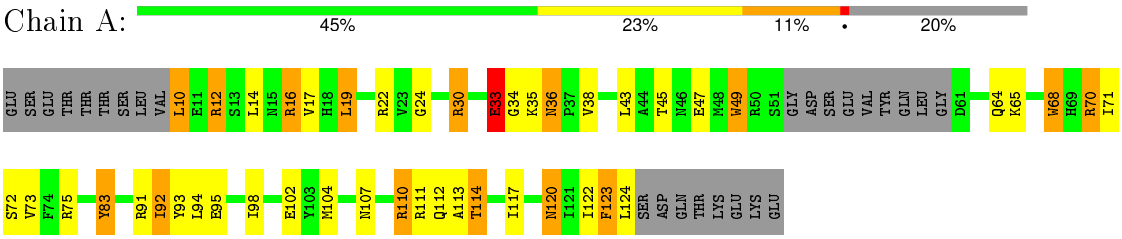
3 Residue-property plots (i)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

Note EDS was not executed.

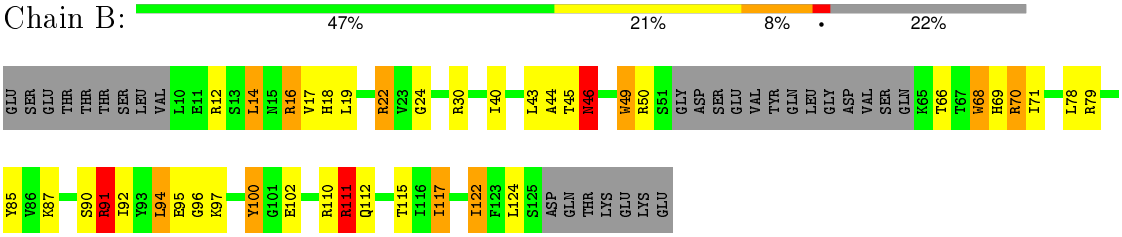
- Molecule 1: DNA BINDING PROTEIN

Chain A:



- Molecule 1: DNA BINDING PROTEIN

Chain B:



4 Data and refinement statistics (i)

Xtriage (Phenix) and EDS were not executed - this section will therefore be incomplete.

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α, β, γ	51.83Å 51.83Å 184.24Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 2.40	Depositor
% Data completeness (in resolution range)	92.1 (10.00-2.40)	Depositor
R_{merge}	0.05	Depositor
R_{sym}	0.04	Depositor
Refinement program	X-PLOR 3.0	Depositor
R, R_{free}	0.195 , 0.237	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	1756	wwPDB-VP
Average B, all atoms (Å^2)	35.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

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	0.82	0/886	1.72	17/1194 (1.4%)
1	B	0.86	0/862	1.86	24/1161 (2.1%)
All	All	0.84	0/1748	1.79	41/2355 (1.7%)

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
1	A	0	1

There are no bond length outliers.

All (41) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	91	ARG	NE-CZ-NH1	13.03	126.81	120.30
1	A	16	ARG	NE-CZ-NH1	11.92	126.26	120.30
1	B	85	TYR	CB-CG-CD2	-11.28	114.23	121.00
1	A	22	ARG	NE-CZ-NH2	-11.15	114.72	120.30
1	B	12	ARG	NE-CZ-NH1	10.45	125.53	120.30
1	B	16	ARG	NE-CZ-NH2	-10.18	115.21	120.30
1	B	91	ARG	NE-CZ-NH2	-10.09	115.26	120.30
1	B	70	ARG	NE-CZ-NH1	9.50	125.05	120.30
1	B	111	ARG	NE-CZ-NH1	9.21	124.91	120.30
1	B	16	ARG	NE-CZ-NH1	8.51	124.56	120.30
1	B	79	ARG	NE-CZ-NH2	-8.33	116.14	120.30
1	B	68	TRP	CD1-CG-CD2	8.02	112.71	106.30
1	B	68	TRP	CE2-CD2-CG	-7.90	100.98	107.30
1	B	85	TYR	CB-CG-CD1	7.82	125.69	121.00
1	B	111	ARG	NE-CZ-NH2	-7.46	116.57	120.30
1	A	49	TRP	CD1-CG-CD2	7.46	112.27	106.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	49	TRP	CE2-CD2-CG	-7.20	101.54	107.30
1	A	68	TRP	CD1-CG-CD2	7.13	112.01	106.30
1	A	68	TRP	CE2-CD2-CG	-7.12	101.60	107.30
1	A	19	LEU	CA-CB-CG	7.01	131.43	115.30
1	A	49	TRP	CE2-CD2-CG	-6.88	101.80	107.30
1	A	14	LEU	CA-CB-CG	6.64	130.58	115.30
1	B	49	TRP	CD1-CG-CD2	6.52	111.51	106.30
1	B	22	ARG	NE-CZ-NH2	-6.32	117.14	120.30
1	B	14	LEU	CB-CG-CD1	-6.25	100.38	111.00
1	A	33	GLU	CA-CB-CG	6.18	127.00	113.40
1	B	49	TRP	CG-CD2-CE3	6.03	139.32	133.90
1	A	70	ARG	NE-CZ-NH1	6.00	123.30	120.30
1	A	16	ARG	NE-CZ-NH2	-5.90	117.35	120.30
1	A	10	LEU	CA-CB-CG	5.77	128.57	115.30
1	A	123	PHE	CB-CG-CD2	-5.76	116.77	120.80
1	B	49	TRP	CB-CG-CD1	-5.60	119.72	127.00
1	B	94	LEU	CA-CB-CG	5.44	127.82	115.30
1	A	70	ARG	NE-CZ-NH2	-5.41	117.60	120.30
1	B	46	ASN	CA-CB-CG	5.31	125.08	113.40
1	A	112	GLN	CA-CB-CG	5.26	124.96	113.40
1	B	79	ARG	NE-CZ-NH1	5.18	122.89	120.30
1	B	100	TYR	CB-CG-CD2	-5.17	117.90	121.00
1	A	110	ARG	NE-CZ-NH1	5.09	122.84	120.30
1	A	83	TYR	CB-CG-CD1	-5.06	117.96	121.00
1	B	111	ARG	CA-C-N	-5.02	106.16	117.20

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	83	TYR	Sidechain

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	A	871	0	884	33	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	847	0	863	32	0
2	A	19	0	0	0	0
2	B	19	0	0	0	0
All	All	1756	0	1747	58	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 17.

All (58) 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:17:VAL:HG22	1:B:17:VAL:HG12	1.59	0.85
1:B:94:LEU:HD12	1:B:117:ILE:HG12	1.62	0.80
1:A:12:ARG:HE	1:A:12:ARG:H	1.28	0.78
1:A:94:LEU:HD13	1:A:117:ILE:HG12	1.68	0.75
1:A:113:ALA:N	1:B:111:ARG:HH22	1.88	0.71
1:B:30:ARG:HG3	1:B:40:ILE:HD12	1.76	0.67
1:A:117:ILE:HG21	1:A:120:ASN:ND2	2.12	0.63
1:A:113:ALA:H	1:B:111:ARG:HH12	1.46	0.63
1:B:45:THR:OG1	1:B:69:HIS:HE1	1.82	0.62
1:A:117:ILE:HG21	1:A:120:ASN:HD21	1.65	0.62
1:A:36:ASN:HD22	1:A:36:ASN:H	1.48	0.61
1:A:71:ILE:HG21	1:A:117:ILE:HD11	1.82	0.61
1:A:72:SER:OG	1:A:114:THR:HG21	2.00	0.61
1:A:30:ARG:HE	1:A:30:ARG:HA	1.68	0.59
1:A:92:ILE:HD11	1:A:122:ILE:HD13	1.85	0.59
1:A:12:ARG:H	1:A:12:ARG:NE	2.00	0.58
1:B:70:ARG:HH22	1:B:112:GLN:HG2	1.69	0.58
1:A:12:ARG:HE	1:A:12:ARG:N	2.01	0.57
1:B:16:ARG:HD2	1:B:18:HIS:NE2	2.20	0.56
1:B:96:GLY:HA3	1:B:117:ILE:HD12	1.89	0.55
1:A:73:VAL:HG22	1:A:117:ILE:HD12	1.88	0.55
1:B:19:LEU:HB2	1:B:94:LEU:HD23	1.89	0.55
1:B:70:ARG:NH2	1:B:112:GLN:HG2	2.22	0.54
1:B:102:GLU:HA	1:B:110:ARG:O	2.10	0.52
1:A:113:ALA:H	1:B:111:ARG:NH1	2.11	0.49
1:A:36:ASN:ND2	1:A:36:ASN:H	2.10	0.49
1:B:111:ARG:HH11	1:B:111:ARG:CB	2.26	0.49
1:B:24:GLY:HA3	1:B:68:TRP:HZ3	1.78	0.49
1:B:19:LEU:HB2	1:B:94:LEU:CD2	2.43	0.48
1:B:46:ASN:HB3	1:B:66:THR:HA	1.95	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:100:TYR:HB3	1:B:111:ARG:HD3	1.95	0.47
1:B:122:ILE:HG22	1:B:124:LEU:HG	1.95	0.47
1:A:94:LEU:HD22	1:A:117:ILE:HD11	1.95	0.47
1:A:47:GLU:HG2	1:B:97:LYS:NZ	2.31	0.46
1:A:49:TRP:CZ2	1:A:65:LYS:HB2	2.51	0.46
1:A:98:ILE:HD11	1:B:17:VAL:HG11	1.98	0.45
1:B:91:ARG:O	1:B:92:ILE:HD13	2.16	0.45
1:B:22:ARG:HA	1:B:90:SER:O	2.16	0.45
1:A:113:ALA:H	1:B:111:ARG:HH22	1.63	0.45
1:B:111:ARG:HH11	1:B:111:ARG:HB2	1.83	0.44
1:A:24:GLY:HA3	1:A:68:TRP:HZ3	1.82	0.44
1:B:95:GLU:O	1:B:117:ILE:HG13	2.18	0.44
1:A:33:GLU:HG2	1:A:34:GLY:H	1.82	0.43
1:A:117:ILE:HG21	1:A:117:ILE:HD13	1.79	0.43
1:A:30:ARG:NE	1:A:30:ARG:HA	2.33	0.43
1:B:100:TYR:HB3	1:B:111:ARG:CD	2.48	0.42
1:B:40:ILE:HA	1:B:71:ILE:O	2.18	0.42
1:B:92:ILE:CD1	1:B:122:ILE:HG23	2.49	0.42
1:B:44:ALA:HB2	1:B:68:TRP:CZ3	2.54	0.42
1:A:93:TYR:HB2	1:A:123:PHE:CZ	2.54	0.42
1:A:91:ARG:HB3	1:A:123:PHE:HD2	1.84	0.42
1:A:17:VAL:O	1:A:95:GLU:HA	2.19	0.41
1:A:70:ARG:O	1:A:114:THR:HG22	2.20	0.41
1:A:110:ARG:HA	1:A:110:ARG:HD2	1.88	0.41
1:A:110:ARG:HG3	1:A:111:ARG:H	1.86	0.40
1:B:102:GLU:HG2	1:B:111:ARG:HG2	2.02	0.40
1:B:24:GLY:HA3	1:B:68:TRP:CZ3	2.56	0.40
1:A:16:ARG:HG3	1:A:16:ARG:HH11	1.85	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	102/132 (77%)	89 (87%)	11 (11%)	2 (2%)	9 11
1	B	99/132 (75%)	90 (91%)	9 (9%)	0	100 100
All	All	201/264 (76%)	179 (89%)	20 (10%)	2 (1%)	19 28

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	33	GLU
1	A	75	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	95/119 (80%)	78 (82%)	17 (18%)	2 2
1	B	92/119 (77%)	80 (87%)	12 (13%)	5 6
All	All	187/238 (79%)	158 (84%)	29 (16%)	3 4

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	10	LEU
1	A	12	ARG
1	A	19	LEU
1	A	30	ARG
1	A	35	LYS
1	A	36	ASN
1	A	38	VAL
1	A	43	LEU
1	A	45	THR
1	A	64	GLN
1	A	92	ILE
1	A	102	GLU
1	A	104	MET
1	A	107	ASN

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Mol	Chain	Res	Type
1	A	114	THR
1	A	120	ASN
1	A	124	LEU
1	B	14	LEU
1	B	43	LEU
1	B	46	ASN
1	B	49	TRP
1	B	50	ARG
1	B	78	LEU
1	B	87	LYS
1	B	91	ARG
1	B	111	ARG
1	B	115	THR
1	B	117	ILE
1	B	122	ILE

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	31	GLN
1	A	36	ASN
1	A	46	ASN
1	A	120	ASN
1	B	69	HIS
1	B	108	ASN

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

There are no ligands in this entry.

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

6.1 Protein, DNA and RNA chains

EDS was not executed - this section will therefore be empty.

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

EDS was not executed - this section will therefore be empty.

6.3 Carbohydrates

EDS was not executed - this section will therefore be empty.

6.4 Ligands

EDS was not executed - this section will therefore be empty.

6.5 Other polymers

EDS was not executed - this section will therefore be empty.