



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 5, 2026 – 05:33 PM UTC

PDB ID : 3DOS / pdb_00003dos
Title : Crystal structure of the complex of the Caf1M chaperone with the mini-fiber of two Caf1 subunits (Caf1:Caf1), carrying the Thr7Phe and Ala9Val mutations in the Gd donor strand
Authors : Fooks, L.J.; Yu, X.; Moslehi-Mohebi, E.; Tischenko, V.; Knight, S.D.; MacIntyre, S.; Zavialov, A.V.
Deposited on : 2008-07-06
Resolution : 2.40 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 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 : 4-5-2 with Phenix2.0
Xtrriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

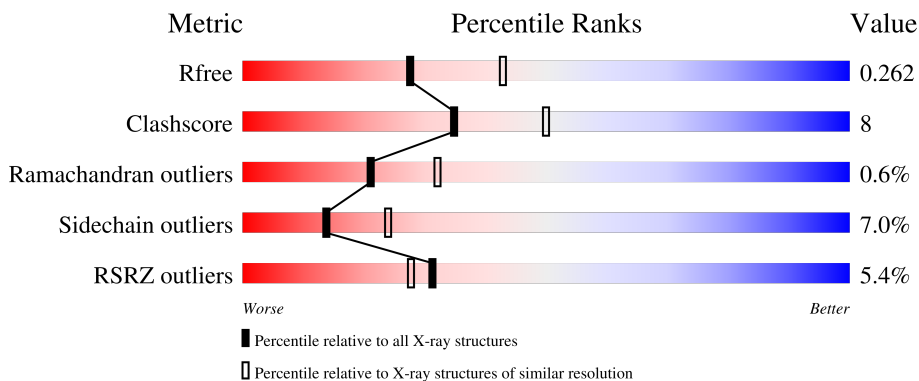
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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))
R_{free}	180053	4912 (2.40-2.40)
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (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 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	235	 4% 71% 13% • 14%
1	D	235	 7% 62% 17% • 19%
2	B	149	 7% 79% 19% •••
2	C	149	 5% 74% 16% • 9%
2	E	149	 3% 81% 17% •

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Mol	Chain	Length	Quality of chain
2	F	149	 <p>A horizontal bar chart representing the quality of chain. The bar is divided into four segments: a small red segment at the beginning labeled '2%', a large green segment labeled '68%', a yellow segment labeled '19%', and a small grey segment at the end labeled '11%'.</p>

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 7373 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 Chaperone protein caf1M.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	203	1550	998	265	283	4	0	0	2
1	D	191	1481	956	251	270	4	0	0	0

- Molecule 2 is a protein called F1 capsule antigen.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	148	1085	677	178	228	2	0	0	1
2	C	135	996	619	165	210	2	0	0	0
2	E	149	1096	683	180	231	2	0	0	0
2	F	132	973	602	162	207	2	0	0	1

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	7	PHE	THR	engineered mutation	UNP P26948
B	9	VAL	ALA	engineered mutation	UNP P26948
C	7	PHE	THR	engineered mutation	UNP P26948
C	9	VAL	ALA	engineered mutation	UNP P26948
E	7	PHE	THR	engineered mutation	UNP P26948
E	9	VAL	ALA	engineered mutation	UNP P26948
F	7	PHE	THR	engineered mutation	UNP P26948
F	9	VAL	ALA	engineered mutation	UNP P26948

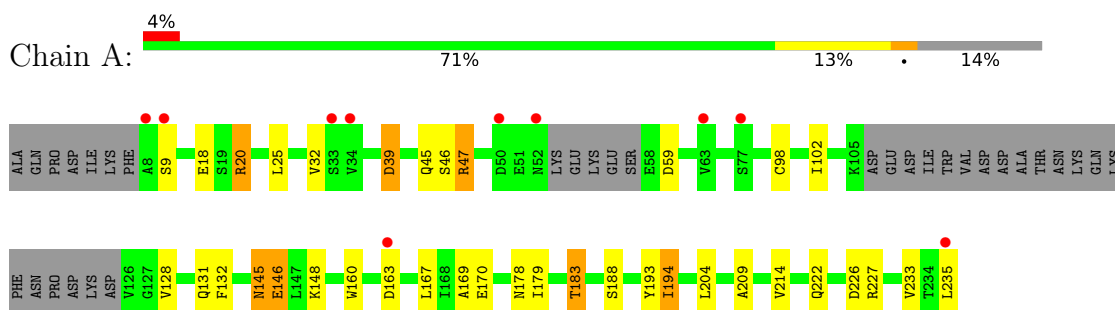
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	59	Total O 59 59	0	0
3	B	10	Total O 10 10	0	0
3	C	42	Total O 42 42	0	0
3	D	22	Total O 22 22	0	0
3	E	29	Total O 29 29	0	0
3	F	30	Total O 30 30	0	0

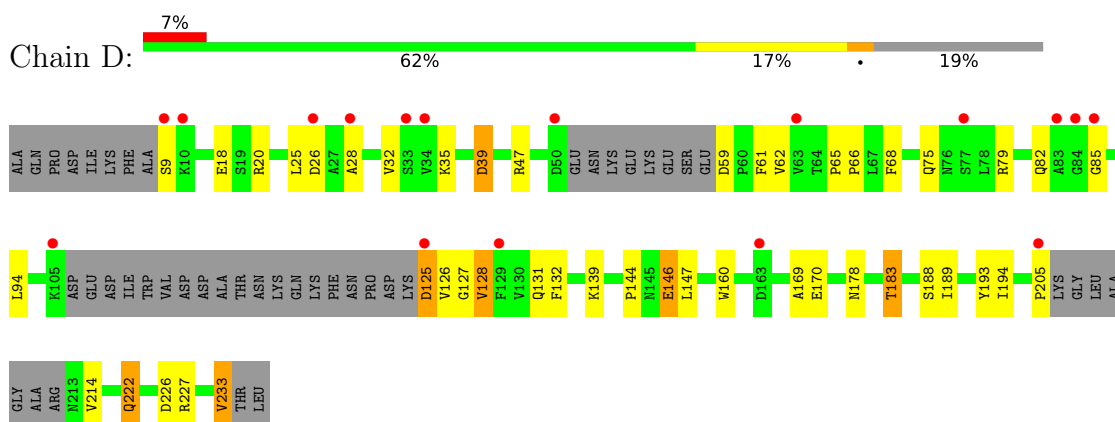
3 Residue-property plots [i](#)

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.

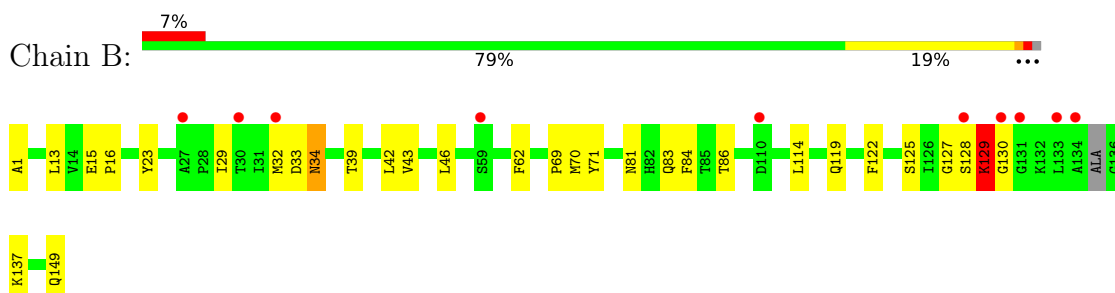
- Molecule 1: Chaperone protein caf1M



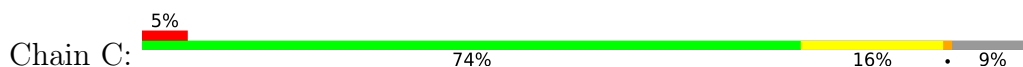
- Molecule 1: Chaperone protein caf1M

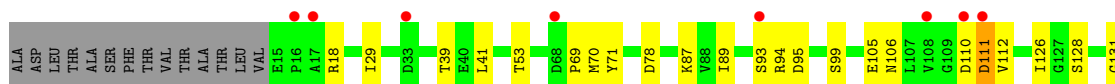


- Molecule 2: F1 capsule antigen

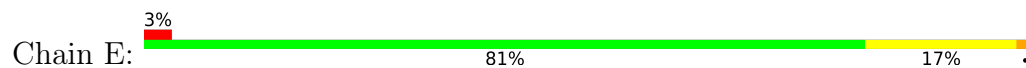


- Molecule 2: F1 capsule antigen





- Molecule 2: F1 capsule antigen



- Molecule 2: F1 capsule antigen



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	72.23Å 91.18Å 166.02Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	31.64 – 2.40 31.64 – 2.40	Depositor EDS
% Data completeness (in resolution range)	91.1 (31.64-2.40) 91.1 (31.64-2.40)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.86 (at 2.39Å)	Xtrriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.214 , 0.264 0.213 , 0.262	Depositor DCC
R_{free} test set	2008 reflections (4.60%)	wwPDB-VP
Wilson B-factor (Å ²)	25.9	Xtrriage
Anisotropy	0.428	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 36.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	7373	wwPDB-VP
Average B, all atoms (Å ²)	24.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 25.27 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 3.2741e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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](#)

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	0.87	0/1587	0.96	2/2157 (0.1%)
1	D	0.89	0/1517	1.02	3/2062 (0.1%)
2	B	0.85	1/1099 (0.1%)	0.94	0/1491
2	C	0.91	0/1010	0.93	0/1370
2	E	0.76	0/1111	0.93	0/1510
2	F	0.95	0/985	0.97	1/1332 (0.1%)
All	All	0.87	1/7309 (0.0%)	0.96	6/9922 (0.1%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	16	PRO	C-O	-5.01	1.17	1.23

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	43	VAL	N-CA-C	-5.95	104.71	110.72
1	D	222	GLN	N-CA-C	-5.40	106.06	113.30
1	D	59	ASP	CA-C-N	5.34	126.51	119.84
1	D	59	ASP	C-N-CA	5.34	126.51	119.84
1	A	145	ASN	CA-C-N	5.31	127.92	120.28

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	A	1550	0	1540	23	0
1	D	1481	0	1464	35	0
2	B	1085	0	1068	23	0
2	C	996	0	973	16	0
2	E	1096	0	1079	17	0
2	F	973	0	945	16	0
3	A	59	0	0	6	0
3	B	10	0	0	0	0
3	C	42	0	0	0	0
3	D	22	0	0	2	0
3	E	29	0	0	1	0
3	F	30	0	0	2	0
All	All	7373	0	7069	107	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 8.

The worst 5 of 107 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:D:189:ILE:CD1	1:D:205:PRO:HG3	1.91	1.00
1:D:144:PRO:HB2	1:D:146:GLU:HG2	1.46	0.97
1:D:189:ILE:HD11	1:D:205:PRO:HG3	1.52	0.90
2:E:13:LEU:HD22	2:F:29:ILE:HB	1.60	0.83
2:C:87:LYS:HE3	2:C:89:ILE:HD12	1.61	0.82

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	197/235 (84%)	191 (97%)	4 (2%)	2 (1%)	12 20

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	D	183/235 (78%)	173 (94%)	9 (5%)	1 (0%)	24	37
2	B	144/149 (97%)	134 (93%)	8 (6%)	2 (1%)	9	13
2	C	133/149 (89%)	128 (96%)	5 (4%)	0	100	100
2	E	147/149 (99%)	145 (99%)	2 (1%)	0	100	100
2	F	128/149 (86%)	123 (96%)	4 (3%)	1 (1%)	16	25
All	All	932/1066 (87%)	894 (96%)	32 (3%)	6 (1%)	21	32

5 of 6 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	209	ALA
2	B	33	ASP
2	B	129	LYS
1	D	85	GLY
2	F	17	ALA

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	166/204 (81%)	153 (92%)	13 (8%)	11	20
1	D	161/204 (79%)	149 (92%)	12 (8%)	12	21
2	B	120/122 (98%)	115 (96%)	5 (4%)	26	45
2	C	110/122 (90%)	103 (94%)	7 (6%)	16	28
2	E	121/122 (99%)	111 (92%)	10 (8%)	10	17
2	F	107/122 (88%)	99 (92%)	8 (8%)	12	21
All	All	785/896 (88%)	730 (93%)	55 (7%)	14	24

5 of 55 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	125	ASP

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Mol	Chain	Res	Type
1	D	214	VAL
2	F	129	LYS
2	F	93	SER
1	D	128	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 15 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	38	GLN
2	E	83	GLN
1	D	145	ASN
2	E	148	ASN
1	D	222	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 oligosaccharides 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 [i](#)

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	203/235 (86%)	0.27	10 (4%) 35 31	3, 20, 38, 49	6 (2%)
1	D	191/235 (81%)	0.58	17 (8%) 15 12	5, 24, 41, 50	5 (2%)
2	B	148/149 (99%)	0.52	10 (6%) 23 20	6, 28, 51, 57	1 (0%)
2	C	135/149 (90%)	-0.00	8 (5%) 28 24	6, 19, 39, 47	0
2	E	149/149 (100%)	0.27	4 (2%) 56 52	6, 27, 46, 53	1 (0%)
2	F	132/149 (88%)	-0.04	3 (2%) 61 57	6, 19, 38, 48	0
All	All	958/1066 (89%)	0.29	52 (5%) 31 28	3, 22, 45, 57	13 (1%)

The worst 5 of 52 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	33	SER	14.9
1	A	33	SER	13.7
1	D	34	VAL	11.9
1	A	34	VAL	11.6
1	A	8	ALA	7.9

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 oligosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.