



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2026 – 07:48 AM UTC

PDB ID : 6FQA / pdb_00006fqa
Title : Crystal structure of the CsuC-CsuA/B chaperone-subunit preassembly complex of the archaic chaperone-usher Csu pili of *Acinetobacter baumannii*
Authors : Parilova, O.; Pakharukova, N.A.; Malmi, H.; Tuitilla, M.; Paavilainen, S.; Zavialov, A.V.
Deposited on : 2018-02-13
Resolution : 2.85 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

<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
Xtriage (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

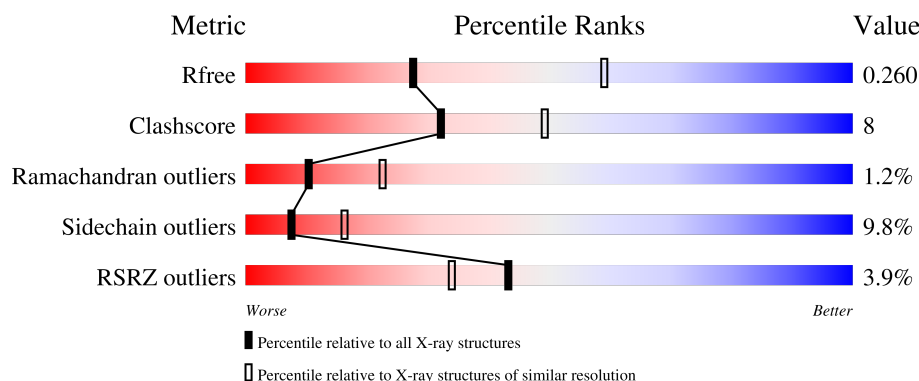
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.85 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	1407 (2.88-2.84)
Clashscore	190562	1446 (2.88-2.84)
Ramachandran outliers	187476	1406 (2.88-2.84)
Sidechain outliers	187428	1407 (2.88-2.84)
RSRZ outliers	180081	1408 (2.88-2.84)

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	243	2% 75% 16% • 6%
1	C	243	0% 72% 19% • 6%
2	B	152	11% 62% 19% • 15%
2	D	152	4% 62% 20% • • 14%

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 5499 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 CsuC.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	229	Total	C	N	O	S	0	0	0
			1788	1138	307	339	4			
1	C	228	Total	C	N	O	S	0	0	0
			1786	1138	306	338	4			

- Molecule 2 is a protein called CsuA/B,CsuA/B.

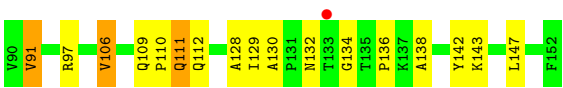
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	129	Total	C	N	O	S	0	0	0
			957	591	168	196	2			
2	D	130	Total	C	N	O	S	0	0	0
			968	600	167	199	2			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	4	HIS	-	linker	UNP Q6XBY7
B	5	HIS	-	linker	UNP Q6XBY7
B	6	HIS	-	linker	UNP Q6XBY7
B	7	HIS	-	linker	UNP Q6XBY7
B	8	HIS	-	linker	UNP Q6XBY7
B	9	HIS	-	linker	UNP Q6XBY7
D	4	HIS	-	linker	UNP Q6XBY7
D	5	HIS	-	linker	UNP Q6XBY7
D	6	HIS	-	linker	UNP Q6XBY7
D	7	HIS	-	linker	UNP Q6XBY7
D	8	HIS	-	linker	UNP Q6XBY7
D	9	HIS	-	linker	UNP Q6XBY7

- Molecule 1: CsuC





4 Data and refinement statistics

Property	Value	Source
Space group	P 65 2 2	Depositor
Cell constants a, b, c, α , β , γ	94.38Å 94.38Å 390.75Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	47.19 – 2.85 47.19 – 2.85	Depositor EDS
% Data completeness (in resolution range)	98.6 (47.19-2.85) 98.5 (47.19-2.85)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.16	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.72 (at 2.86Å)	Xtriage
Refinement program	PHENIX 1.13_2998	Depositor
R, R_{free}	0.197 , 0.262 0.196 , 0.260	Depositor DCC
R_{free} test set	1310 reflections (4.31%)	wwPDB-VP
Wilson B-factor (Å ²)	56.3	Xtriage
Anisotropy	0.101	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 43.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	5499	wwPDB-VP
Average B, all atoms (Å ²)	58.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.96% 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 [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	0.37	0/1819	0.60	0/2452
1	C	0.38	0/1818	0.60	0/2450
2	B	0.35	0/970	0.66	0/1319
2	D	0.33	0/983	0.69	2/1340 (0.1%)
All	All	0.37	0/5590	0.63	2/7561 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	84	ASN	CA-C-N	5.17	131.00	121.70
2	D	84	ASN	C-N-CA	5.17	131.00	121.70

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	1788	0	1835	19	0
1	C	1786	0	1831	29	0
2	B	957	0	907	25	0
2	D	968	0	922	25	0
All	All	5499	0	5495	88	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.

All (88) 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)
2:D:35:THR:HG21	2:D:91:VAL:HG11	1.63	0.79
2:B:84:ASN:O	2:B:85:THR:OG1	2.05	0.74
2:D:97:ARG:HH11	2:D:111:GLN:HG2	1.50	0.73
1:C:45:LEU:HD13	1:C:204:LYS:HD3	1.70	0.72
1:C:37:VAL:HG23	1:C:57:PRO:HG3	1.72	0.70
1:A:11:LYS:HG3	1:A:129:SER:HB3	1.75	0.68
2:B:37:GLY:H	2:B:138:ALA:H	1.42	0.67
2:D:84:ASN:ND2	2:D:85:THR:OG1	2.32	0.63
2:D:106:VAL:HG13	2:D:109:GLN:HB2	1.82	0.62
1:C:167:ASN:HB2	1:C:197:VAL:HG12	1.82	0.62
1:C:191:LYS:HE2	2:D:112:GLN:H	1.65	0.62
1:C:110:VAL:HG13	2:D:30:LEU:HB2	1.83	0.59
2:D:69:THR:HG23	2:D:110:PRO:HB3	1.84	0.59
2:D:84:ASN:O	2:D:85:THR:HG23	2.02	0.59
1:C:108:SER:HB3	2:D:33:GLY:O	2.03	0.58
1:C:192:ALA:HB1	1:C:205:PHE:CD2	2.40	0.57
2:D:37:GLY:HA2	2:D:136:PRO:HB3	1.87	0.56
2:B:6:HIS:N	2:B:7:HIS:HA	2.21	0.56
1:C:174:ARG:HD2	1:C:226:SER:OG	2.08	0.54
2:B:83:LYS:NZ	2:B:87:SER:O	2.35	0.54
2:D:132:ASN:O	2:D:134:GLY:N	2.38	0.54
2:D:97:ARG:NH1	2:D:111:GLN:HG2	2.21	0.53
1:A:52:GLN:OE1	1:A:55:ILE:N	2.33	0.53
2:B:36:SER:HB2	2:B:138:ALA:HA	1.89	0.53
2:D:73:ASP:HB2	2:D:147:LEU:HB3	1.90	0.53
1:A:229:ILE:HG23	2:B:8:HIS:HB2	1.90	0.52
1:A:10:PRO:HD2	1:A:119:PRO:O	2.10	0.52
1:C:156:ASN:HB3	1:C:158:GLN:H	1.74	0.52
2:B:43:LEU:O	2:B:128:ALA:HA	2.10	0.52
2:B:83:LYS:HE3	2:B:85:THR:HA	1.92	0.52
2:B:39:TRP:HD1	2:B:41:ASN:O	1.93	0.51
2:B:83:LYS:HG2	2:B:85:THR:H	1.75	0.51
1:A:197:VAL:HG13	1:A:203:VAL:HG22	1.92	0.50
1:A:212:ALA:O	1:A:213:HIS:HB3	2.12	0.50
1:A:166:LYS:HB2	1:A:202:THR:HB	1.94	0.49
1:A:175:LEU:HA	1:A:224:VAL:O	2.13	0.49
2:B:103:ASN:ND2	2:B:111:GLN:OE1	2.45	0.49
1:A:110:VAL:HG13	2:B:30:LEU:HB2	1.95	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:163:LEU:HD23	1:C:205:PHE:CZ	2.47	0.48
2:B:39:TRP:CD1	2:B:41:ASN:O	2.67	0.47
1:C:52:GLN:OE1	1:C:54:GLU:N	2.47	0.47
2:B:97:ARG:HH11	2:B:111:GLN:HG2	1.80	0.47
1:C:192:ALA:HB1	1:C:205:PHE:HD2	1.79	0.47
2:B:37:GLY:C	2:B:136:PRO:HB3	2.41	0.46
2:B:97:ARG:NH1	2:B:111:GLN:HG2	2.31	0.46
1:C:21:VAL:O	1:C:72:LEU:HB2	2.15	0.46
1:C:46:LYS:HD3	1:C:46:LYS:HA	1.66	0.46
1:A:117:SER:HB3	2:B:151:ASN:ND2	2.31	0.46
1:C:52:GLN:OE1	1:C:55:ILE:N	2.35	0.46
1:A:32:MET:HE2	1:A:32:MET:HB2	1.63	0.45
2:D:73:ASP:CB	2:D:147:LEU:H	2.29	0.45
1:A:14:ALA:HA	1:A:123:TYR:O	2.16	0.45
1:A:80:LEU:HD22	1:A:86:GLN:HG3	1.99	0.45
2:B:47:VAL:HG13	2:B:55:ASN:OD1	2.16	0.45
2:D:39:TRP:NE1	2:D:130:ALA:O	2.33	0.45
2:D:73:ASP:OD1	2:D:74:GLY:N	2.45	0.45
2:B:69:THR:HG23	2:B:110:PRO:HB3	1.99	0.44
1:C:109:LYS:O	2:D:143:LYS:HA	2.17	0.44
2:D:82:LEU:HB3	2:D:142:TYR:HB3	1.99	0.44
1:A:191:LYS:HD2	1:A:191:LYS:HA	1.60	0.43
1:A:222:TYR:HB3	1:A:233:LEU:HG	2.00	0.43
1:C:42:GLN:HA	1:C:46:LYS:O	2.18	0.43
1:C:71:MET:HE2	1:C:71:MET:HB3	1.83	0.43
2:D:73:ASP:HB3	2:D:147:LEU:H	1.83	0.43
2:B:106:VAL:HG13	2:B:109:GLN:HB2	2.00	0.43
1:C:125:LYS:HE3	1:C:125:LYS:HB2	1.74	0.43
1:C:191:LYS:CE	2:D:112:GLN:H	2.31	0.43
1:A:108:SER:OG	2:B:142:TYR:HB2	2.17	0.42
2:B:82:LEU:HB3	2:B:142:TYR:HB3	2.02	0.42
1:C:160:GLN:NE2	1:C:206:ALA:HB1	2.34	0.42
1:C:12:ILE:O	1:C:122:ALA:HA	2.20	0.42
1:A:126:GLY:HA2	1:A:138:LEU:HD11	2.02	0.42
2:B:34:LYS:HB2	2:B:34:LYS:HE3	1.71	0.42
1:C:192:ALA:HB2	1:C:206:ALA:O	2.20	0.41
2:B:48:ALA:C	2:B:55:ASN:HD22	2.28	0.41
1:C:11:LYS:HG3	1:C:129:SER:HB3	2.01	0.41
1:C:74:LEU:HD13	1:C:120:LEU:HD22	2.02	0.41
2:D:43:LEU:O	2:D:128:ALA:HA	2.21	0.41
1:A:119:PRO:HG3	1:A:196:TYR:OH	2.21	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:132:ASN:HD21	2:B:137:LYS:HE2	1.85	0.41
2:D:97:ARG:HD2	2:D:111:GLN:HG2	2.03	0.41
1:C:85:GLU:HG3	1:C:123:TYR:CE1	2.56	0.41
1:C:90:LEU:HB3	1:C:118:ILE:HG12	2.02	0.40
1:A:109:LYS:HE2	1:A:109:LYS:HB2	1.90	0.40
1:C:4:LEU:HD12	2:D:13:CYS:O	2.22	0.40
2:D:42:VAL:HG13	2:D:129:ILE:O	2.20	0.40
2:D:39:TRP:CE2	2:D:132:ASN:HB2	2.56	0.40
1:C:156:ASN:HB3	1:C:158:GLN:N	2.36	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	225/243 (93%)	215 (96%)	6 (3%)	4 (2%)	6	15
1	C	224/243 (92%)	215 (96%)	7 (3%)	2 (1%)	14	28
2	B	118/152 (78%)	107 (91%)	11 (9%)	0	100	100
2	D	122/152 (80%)	109 (89%)	11 (9%)	2 (2%)	7	17
All	All	689/790 (87%)	646 (94%)	35 (5%)	8 (1%)	10	22

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	214	GLU
2	D	36	SER
1	A	190	GLY
1	C	190	GLY
1	C	192	ALA
1	A	192	ALA

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Mol	Chain	Res	Type
1	A	213	HIS
2	D	138	ALA

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	195/208 (94%)	175 (90%)	20 (10%)	7	14
1	C	195/208 (94%)	174 (89%)	21 (11%)	6	12
2	B	104/120 (87%)	95 (91%)	9 (9%)	9	21
2	D	106/120 (88%)	97 (92%)	9 (8%)	10	22
All	All	600/656 (92%)	541 (90%)	59 (10%)	7	16

All (59) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	8	ILE
1	A	11	LYS
1	A	17	LYS
1	A	23	LEU
1	A	32	MET
1	A	52	GLN
1	A	72	LEU
1	A	97	ILE
1	A	155	ASN
1	A	165	LEU
1	A	176	SER
1	A	180	THR
1	A	188	SER
1	A	189	LEU
1	A	191	LYS
1	A	202	THR
1	A	203	VAL
1	A	215	LEU
1	A	217	LYS

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Mol	Chain	Res	Type
1	A	233	LEU
2	B	6	HIS
2	B	8	HIS
2	B	44	THR
2	B	46	GLU
2	B	69	THR
2	B	91	VAL
2	B	106	VAL
2	B	111	GLN
2	B	137	LYS
1	C	8	ILE
1	C	11	LYS
1	C	17	LYS
1	C	46	LYS
1	C	52	GLN
1	C	70	HIS
1	C	71	MET
1	C	84	LYS
1	C	110	VAL
1	C	118	ILE
1	C	138	LEU
1	C	156	ASN
1	C	165	LEU
1	C	180	THR
1	C	187	ILE
1	C	189	LEU
1	C	202	THR
1	C	210	SER
1	C	211	THR
1	C	215	LEU
1	C	233	LEU
2	D	18	SER
2	D	41	ASN
2	D	44	THR
2	D	69	THR
2	D	83	LYS
2	D	84	ASN
2	D	91	VAL
2	D	106	VAL
2	D	111	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	48	ASN
2	B	8	HIS
1	C	150	GLN
2	D	84	ASN
2	D	111	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

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, 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	229/243 (94%)	-0.35	4 (1%) 69 63	27, 45, 95, 129	0
1	C	228/243 (93%)	-0.48	2 (0%) 81 76	25, 43, 82, 134	0
2	B	129/152 (84%)	0.46	16 (12%) 8 6	31, 78, 137, 174	0
2	D	130/152 (85%)	0.07	6 (4%) 37 29	31, 63, 119, 132	0
All	All	716/790 (90%)	-0.17	28 (3%) 43 34	25, 50, 118, 174	0

All (28) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	48	ALA	6.0
2	B	136	PRO	4.2
1	A	97	ILE	3.5
2	D	85	THR	3.5
2	B	138	ALA	3.3
2	B	52	THR	3.1
1	A	192	ALA	3.0
1	A	216	ALA	3.0
2	B	38	THR	3.0
2	B	55	ASN	2.9
2	B	37	GLY	2.8
2	B	54	GLY	2.8
2	B	86	ALA	2.8
2	D	38	THR	2.8
2	B	17	GLY	2.7
2	B	7	HIS	2.6
2	B	16	GLY	2.6
2	D	31	ASN	2.6
2	D	133	THR	2.5
1	C	193	ALA	2.5
2	B	53	GLY	2.4

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Mol	Chain	Res	Type	RSRZ
1	C	191	LYS	2.3
2	B	39	TRP	2.3
2	B	135	THR	2.2
2	D	9	HIS	2.1
2	D	27	PHE	2.1
1	A	108	SER	2.1
2	B	132	ASN	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 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.