



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 02:58 PM GMT

PDB ID : 4B45
Title : CetZ2 from Haloferax volcanii - GTPgS bound protofilament
Authors : Aylett, C.H.S.; Duggin, I.G.; Lowe, J.
Deposited on : 2012-07-27
Resolution : 2.10 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) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

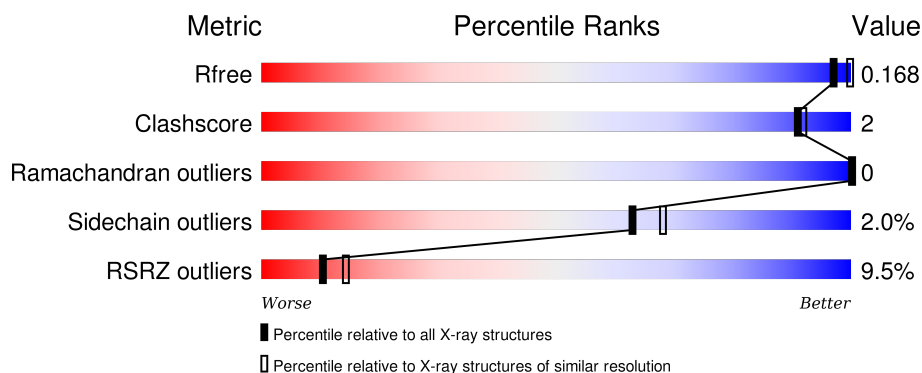
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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}	91344	3939 (2.10-2.10)
Clashscore	102246	4460 (2.10-2.10)
Ramachandran outliers	100387	4413 (2.10-2.10)
Sidechain outliers	100360	4414 (2.10-2.10)
RSRZ outliers	91569	3948 (2.10-2.10)

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 $\leq 5\%$. 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	349	
2	B	19	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 2633 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 CELL DIVISION PROTEIN FTSZ.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	334	Total	C	N	O	S	0	0	0
			2398	1473	425	493	7			

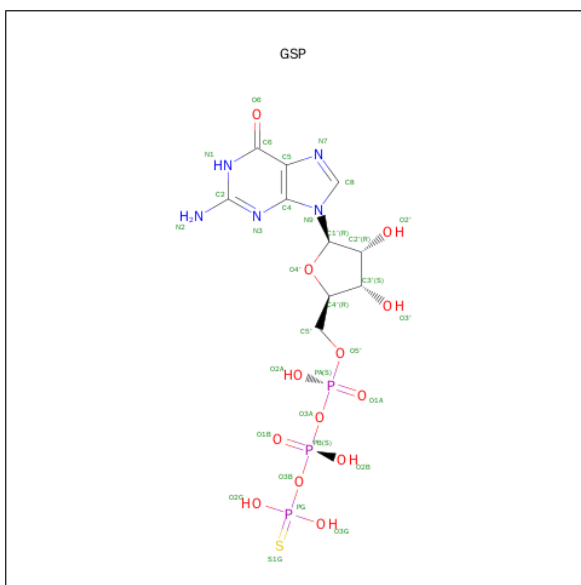
- Molecule 2 is a protein called CELL DIVISION PROTEIN FTSZ.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	13	Total	C	N	O	S	0	0	0
			104	64	16	23	1			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	361	GLY	-	EXPRESSION TAG	UNP D4GTC1
B	362	SER	-	EXPRESSION TAG	UNP D4GTC1
B	363	HIS	-	EXPRESSION TAG	UNP D4GTC1
B	364	HIS	-	EXPRESSION TAG	UNP D4GTC1
B	365	HIS	-	EXPRESSION TAG	UNP D4GTC1
B	366	HIS	-	EXPRESSION TAG	UNP D4GTC1
B	367	HIS	-	EXPRESSION TAG	UNP D4GTC1
B	368	HIS	-	EXPRESSION TAG	UNP D4GTC1

- Molecule 3 is 5'-GUANOSINE-DIPHOSPHATE-MONOTHIOPHOSPHATE (three-letter code: GSP) (formula: C₁₀H₁₆N₅O₁₃P₃S).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	S	0	0
			32	10	5	13	3	1		

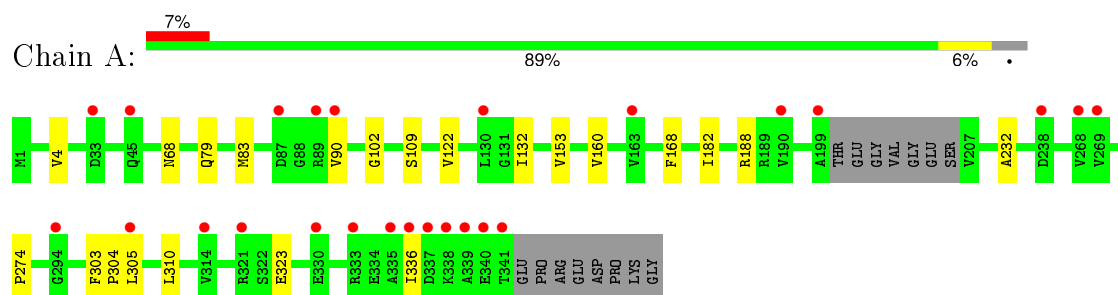
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	99	Total O 99 99	0	0

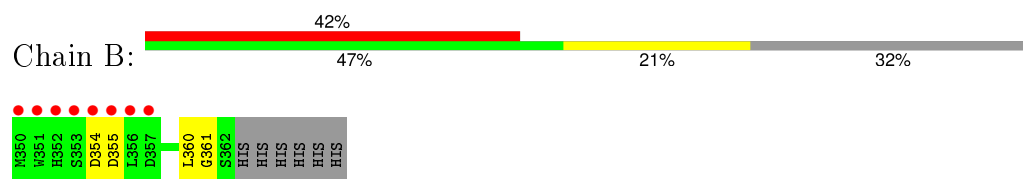
3 Residue-property plots

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.

• Molecule 1: CELL DIVISION PROTEIN FTSZ



• Molecule 2: CELL DIVISION PROTEIN FTSZ



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	42.43 Å 43.22 Å 48.45 Å 68.87° 75.34° 86.90°	Depositor
Resolution (Å)	40.28 – 2.10 40.28 – 2.00	Depositor EDS
% Data completeness (in resolution range)	94.7 (40.28-2.10) 85.8 (40.28-2.00)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.98 (at 2.00 Å)	Xtriage
Refinement program	PHENIX (PHENIX.REFINE)	Depositor
R, R_{free}	0.177 , 0.228 0.170 , 0.168	Depositor DCC
R_{free} test set	923 reflections (5.49%)	DCC
Wilson B-factor (Å ²)	24.7	Xtriage
Anisotropy	0.576	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 62.0	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 20521 reflections	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	2633	wwPDB-VP
Average B, all atoms (Å ²)	55.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.57% 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, 0.375 respectively for untwinned datasets, and 0.333, 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: GSP

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	0.35	0/2419	0.54	0/3277
2	B	0.29	0/106	0.68	0/143
All	All	0.34	0/2525	0.55	0/3420

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	2398	0	2386	11	0
2	B	104	0	87	2	0
3	A	32	0	12	0	0
4	A	99	0	0	0	0
All	All	2633	0	2485	11	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 2.

All (11) 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:68:ASN:ND2	1:A:109:SER:OG	2.18	0.76
1:A:188:ARG:NH2	2:B:361:GLY:O	2.24	0.70
1:A:168:PHE:HB2	1:A:182:ILE:HG12	1.92	0.52
1:A:4:VAL:HG21	1:A:90:VAL:HA	1.93	0.51
1:A:274:PRO:HG3	1:A:304:PRO:HB3	1.95	0.49
1:A:232:ALA:HB2	1:A:310:LEU:HG	1.96	0.48
1:A:305:LEU:HD11	2:B:360:LEU:HD11	1.97	0.46
1:A:102:GLY:HA2	1:A:132:ILE:HB	1.97	0.46
1:A:79:GLN:O	1:A:83:MET:HG2	2.16	0.45
1:A:153:VAL:HG23	1:A:160:VAL:HG21	1.98	0.45
1:A:336:ILE:HD13	1:A:336:ILE:HA	1.80	0.42

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	330/349 (95%)	324 (98%)	6 (2%)	0	100	100
2	B	11/19 (58%)	10 (91%)	1 (9%)	0	100	100
All	All	341/368 (93%)	334 (98%)	7 (2%)	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	
1	A	243/255 (95%)	240 (99%)	3 (1%)	78	84
2	B	12/18 (67%)	10 (83%)	2 (17%)	3	1
All	All	255/273 (93%)	250 (98%)	5 (2%)	63	68

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	122	VAL
1	A	303	PHE
1	A	323	GLU
2	B	354	ASP
2	B	355	ASP

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

Mol	Chain	Res	Type
1	A	68	ASN

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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

1 ligand is modelled in this entry.

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	$\# Z > 2$
3	GSP	A	1342	-	25,34,34	2.82	9 (36%)	31,54,54	1.52	6 (19%)

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
3	GSP	A	1342	-	-	0/15/38/38	0/3/3/3

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1342	GSP	C2'-C3'	-2.58	1.46	1.53
3	A	1342	GSP	O4'-C4'	-2.13	1.40	1.45
3	A	1342	GSP	O3'-C3'	-2.06	1.38	1.43
3	A	1342	GSP	PG-O3G	-2.05	1.48	1.55
3	A	1342	GSP	C4-N3	2.05	1.38	1.35
3	A	1342	GSP	O4'-C1'	3.36	1.45	1.41
3	A	1342	GSP	O6-C6	5.85	1.38	1.24
3	A	1342	GSP	C2-N2	6.44	1.47	1.34
3	A	1342	GSP	PG-S1G	8.61	2.07	1.90

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	1342	GSP	C5-C6-N1	-3.90	118.25	123.59
3	A	1342	GSP	N3-C2-N1	-2.85	123.10	127.44
3	A	1342	GSP	C4-C5-N7	-2.18	107.47	109.48
3	A	1342	GSP	PA-O3A-PB	-2.15	126.70	132.73
3	A	1342	GSP	O2A-PA-O3A	2.11	114.67	105.09
3	A	1342	GSP	C6-N1-C2	3.41	120.67	115.94

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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 ⓘ

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	334/349 (95%)	0.53	25 (7%) 17 23	38, 49, 77, 129	0
2	B	13/19 (68%)	4.28	8 (61%) 0 0	55, 95, 128, 136	0
All	All	347/368 (94%)	0.67	33 (9%) 10 14	38, 49, 84, 136	0

All (33) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	354	ASP	10.1
2	B	355	ASP	9.6
2	B	353	SER	9.4
2	B	351	TRP	7.6
1	A	339	ALA	6.3
1	A	337	ASP	5.9
1	A	340	GLU	4.7
2	B	356	LEU	4.4
1	A	87	ASP	4.2
1	A	89	ARG	4.2
2	B	352	HIS	3.8
2	B	350	MET	3.5
2	B	357	ASP	3.4
1	A	321	ARG	3.3
1	A	269	VAL	3.0
1	A	199	ALA	2.8
1	A	336	ILE	2.7
1	A	238	ASP	2.5
1	A	33	ASP	2.5
1	A	341	THR	2.5
1	A	130	LEU	2.4
1	A	330	GLU	2.4
1	A	305	LEU	2.4
1	A	190	VAL	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	90	VAL	2.2
1	A	314	VAL	2.1
1	A	335	ALA	2.1
1	A	163	VAL	2.1
1	A	45	GLN	2.1
1	A	338	LYS	2.0
1	A	333	ARG	2.0
1	A	268	VAL	2.0
1	A	294	GLY	2.0

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 carbohydrates in this entry.

6.4 Ligands [i](#)

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. The B-factors column lists the minimum, median, 95th 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	LLDF	B-factors(\AA^2)	Q<0.9
3	GSP	A	1342	32/32	0.92	0.15	0.36	40,47,66,121	0

6.5 Other polymers [i](#)

There are no such residues in this entry.