wwPDB X-ray Structure Validation Summary Report (i)

May 29, 2020 – 06:49 am BST

PDB ID	:	5EFV
Title	:	The host-recognition device of Staphylococcus aureus phage Phi11
Authors	:	Koc, C.; Kuhner, P.; Xia, G.; Spinelli, S.; Roussel, A.; Cambillau, C.; Stehle, T.
Deposited on	:	2015-10-26
Resolution	:	2.20 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 (i) symbol.

The following versions of software and data (see references (1)) were used in the production of this report:

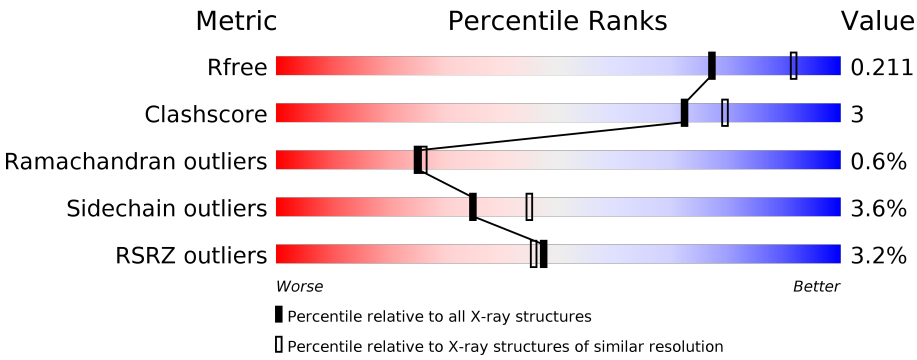
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.11
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

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 2.20 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	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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 on 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 <=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	648	5% 88% 8% • •
1	B	648	% 87% 10% • •
1	C	648	3% 88% 9% • •

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 16771 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 Phi ETA orf 56-like protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	631	5025	3207	845	957	16	0	0	0
1	B	635	5167	3287	885	980	15	0	0	0
1	C	630	5132	3265	883	969	15	0	0	0

There are 36 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-11	HIS	-	expression tag	UNP Q8SDT4
A	-10	HIS	-	expression tag	UNP Q8SDT4
A	-9	HIS	-	expression tag	UNP Q8SDT4
A	-8	HIS	-	expression tag	UNP Q8SDT4
A	-7	HIS	-	expression tag	UNP Q8SDT4
A	-6	HIS	-	expression tag	UNP Q8SDT4
A	-5	LEU	-	expression tag	UNP Q8SDT4
A	-4	VAL	-	expression tag	UNP Q8SDT4
A	-3	PRO	-	expression tag	UNP Q8SDT4
A	-2	ARG	-	expression tag	UNP Q8SDT4
A	-1	GLY	-	expression tag	UNP Q8SDT4
A	0	SER	-	expression tag	UNP Q8SDT4
B	-11	HIS	-	expression tag	UNP Q8SDT4
B	-10	HIS	-	expression tag	UNP Q8SDT4
B	-9	HIS	-	expression tag	UNP Q8SDT4
B	-8	HIS	-	expression tag	UNP Q8SDT4
B	-7	HIS	-	expression tag	UNP Q8SDT4
B	-6	HIS	-	expression tag	UNP Q8SDT4
B	-5	LEU	-	expression tag	UNP Q8SDT4
B	-4	VAL	-	expression tag	UNP Q8SDT4
B	-3	PRO	-	expression tag	UNP Q8SDT4
B	-2	ARG	-	expression tag	UNP Q8SDT4
B	-1	GLY	-	expression tag	UNP Q8SDT4

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
B	0	SER	-	expression tag	UNP Q8SDT4
C	-11	HIS	-	expression tag	UNP Q8SDT4
C	-10	HIS	-	expression tag	UNP Q8SDT4
C	-9	HIS	-	expression tag	UNP Q8SDT4
C	-8	HIS	-	expression tag	UNP Q8SDT4
C	-7	HIS	-	expression tag	UNP Q8SDT4
C	-6	HIS	-	expression tag	UNP Q8SDT4
C	-5	LEU	-	expression tag	UNP Q8SDT4
C	-4	VAL	-	expression tag	UNP Q8SDT4
C	-3	PRO	-	expression tag	UNP Q8SDT4
C	-2	ARG	-	expression tag	UNP Q8SDT4
C	-1	GLY	-	expression tag	UNP Q8SDT4
C	0	SER	-	expression tag	UNP Q8SDT4

- Molecule 2 is FE (III) ION (three-letter code: FE) (formula: Fe).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Fe		
2	A	1	1	1	0	0

- Molecule 3 is water.

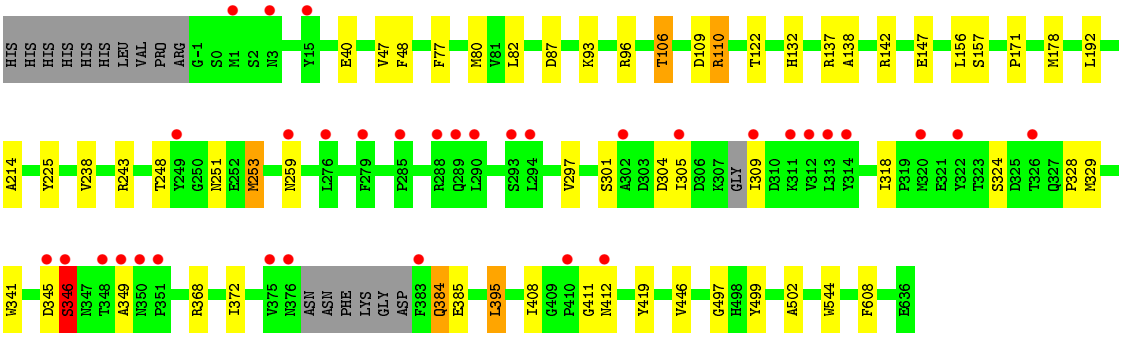
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	A	405	405	405	0	0
			Total	O		
3	B	565	565	565	0	0
			Total	O		
3	C	476	476	476	0	0

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 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.

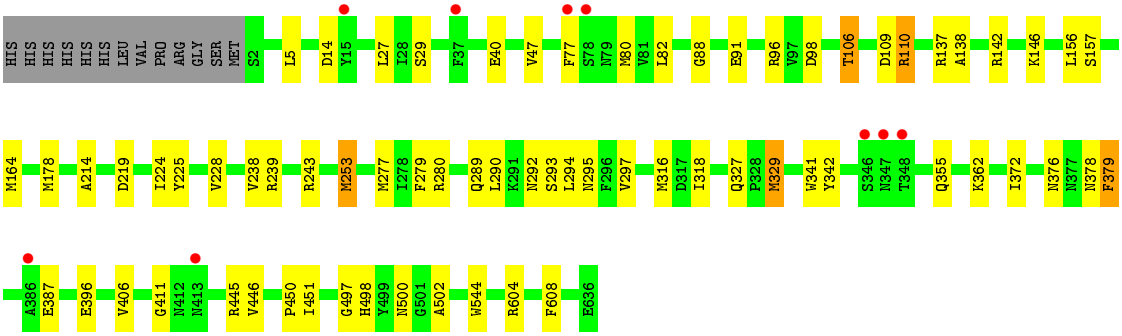
- Molecule 1: Phi ETA orf 56-like protein

Chain A:



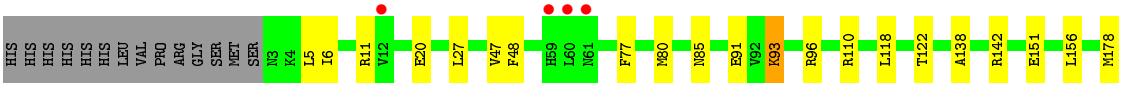
- Molecule 1: Phi ETA orf 56-like protein

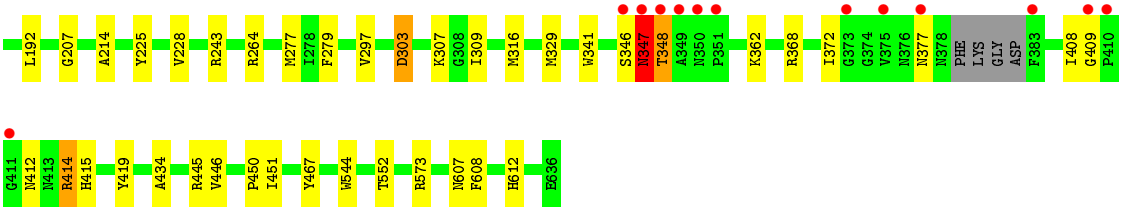
Chain B:



- Molecule 1: Phi ETA orf 56-like protein

Chain C:




L192
G207
A214
Y225
V228
R243
R264
M277
I278
F279
V297
D303
K307
G308
I309
M316
M329
W341
S346
N347
T348
A349
N350
P351
K362
R368
I372
G373
G374
V375
N376
N377
N378
PHE
LYS
GLY
ASP
F383
I408
G409
P410
G411
N412
M413
R414
H415
Y419
A434
R445
V446
P450
I451
Y467
W544
T552
R573
N607
F608
H612
E636

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	87.06Å 89.01Å 93.26Å 93.02° 105.25° 117.58°	Depositor
Resolution (Å)	44.40 – 2.20 44.41 – 2.20	Depositor EDS
% Data completeness (in resolution range)	97.9 (44.40-2.20) 97.9 (44.41-2.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.12 (at 2.20Å)	Xtriage
Refinement program	BUSTER 2.10.2	Depositor
R, R_{free}	0.173 , 0.211 0.175 , 0.211	Depositor DCC
R_{free} test set	5827 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	36.9	Xtriage
Anisotropy	0.426	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.31 , 51.9	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	16771	wwPDB-VP
Average B, all atoms (Å^2)	51.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.16% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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)

Bond lengths and bond angles in the following residue types are not validated in this section: FE

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	0.48	0/5152	0.71	4/6996 (0.1%)
1	B	0.51	1/5298 (0.0%)	0.71	3/7178 (0.0%)
1	C	0.49	0/5260	0.70	2/7124 (0.0%)
All	All	0.49	1/15710 (0.0%)	0.70	9/21298 (0.0%)

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	1	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	253	MET	SD-CE	-5.57	1.46	1.77

The worst 5 of 9 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	347	ASN	C-N-CA	7.25	139.83	121.70
1	B	378	ASN	C-N-CA	7.15	139.57	121.70
1	C	47	VAL	C-N-CA	6.95	139.07	121.70
1	B	47	VAL	C-N-CA	6.09	136.92	121.70
1	A	346	SER	C-N-CA	5.93	136.52	121.70

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	A	451	ILE	CB

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	110	ARG	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	5025	0	4697	31	0
1	B	5167	0	4930	47	0
1	C	5132	0	4911	39	0
2	A	1	0	0	0	0
3	A	405	0	0	2	0
3	B	565	0	0	2	0
3	C	476	0	0	1	0
All	All	16771	0	14538	102	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 3.

The worst 5 of 102 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:B:110:ARG:HH11	1:B:110:ARG:CG	1.76	0.99
1:B:110:ARG:HH11	1:B:110:ARG:HG3	1.25	0.98
1:C:178:MET:HE3	1:C:192:LEU:HD11	1.56	0.88
1:B:106:THR:HG21	3:B:813:HOH:O	1.76	0.85
1:A:345:ASP:HA	1:A:346:SER:O	1.76	0.85

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	627/648 (97%)	598 (95%)	24 (4%)	5 (1%)	19	19
1	B	633/648 (98%)	609 (96%)	21 (3%)	3 (0%)	29	31
1	C	626/648 (97%)	601 (96%)	21 (3%)	4 (1%)	25	26
All	All	1886/1944 (97%)	1808 (96%)	66 (4%)	12 (1%)	25	26

5 of 12 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	346	SER
1	C	347	ASN
1	C	348	THR
1	A	349	ALA
1	A	411	GLY

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	522/575 (91%)	501 (96%)	21 (4%)	31	40
1	B	554/575 (96%)	534 (96%)	20 (4%)	35	45
1	C	551/575 (96%)	534 (97%)	17 (3%)	40	51
All	All	1627/1725 (94%)	1569 (96%)	58 (4%)	35	45

5 of 58 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	146	LYS
1	B	329	MET
1	C	377	ASN
1	B	219	ASP
1	B	277	MET

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 25 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	384	GLN
1	C	85	ASN
1	C	436	GLN
1	B	413	ASN
1	C	108	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 carbohydrates in this entry.

5.6 Ligand geometry (i)

Of 1 ligands modelled in this entry, 1 is monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

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 (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	631/648 (97%)	0.02	34 (5%)	25	24	28, 52, 100, 134	0
1	B	635/648 (97%)	-0.40	9 (1%)	75	73	27, 43, 71, 119	0
1	C	630/648 (97%)	-0.31	17 (2%)	54	52	28, 47, 79, 120	0
All	All	1896/1944 (97%)	-0.23	60 (3%)	47	45	27, 47, 90, 134	0

The worst 5 of 60 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	348	THR	6.6
1	A	309	ILE	5.3
1	B	346	SER	5.3
1	A	289	GLN	5.2
1	A	1	MET	5.1

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 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. 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	B-factors(Å^2)	Q<0.9
2	FE	A	701	1/1	1.00	0.09	33,33,33,33	0

6.5 Other polymers (i)

There are no such residues in this entry.