



wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 14, 2017 – 05:43 pm GMT

PDB ID : 2IUT
Title : P. aeruginosa FtsK motor domain, dimeric
Authors : Massey, T.H.; Mercoglian, C.P.; Yates, J.; Sherratt, D.J.; Lowe, J.
Deposited on : 2006-06-07
Resolution : 2.25 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

<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	:	1.7.2 (RC1), CSD as538be (2017)
Xtriage (Phenix)	:	1.9-1692
EDS	:	trunk28620
Percentile statistics	:	20161228.v01 (using entries in the PDB archive December 28th 2016)
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)	:	recalc28949

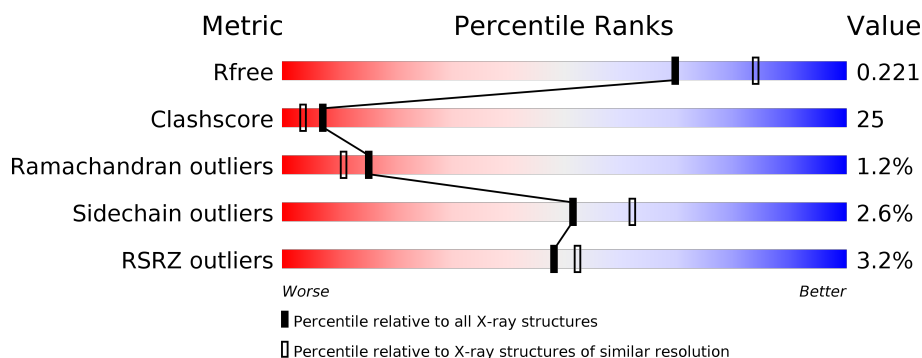
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.25 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}	100719	1062 (2.26-2.26)
Clashscore	112137	1178 (2.26-2.26)
Ramachandran outliers	110173	1145 (2.26-2.26)
Sidechain outliers	110143	1146 (2.26-2.26)
RSRZ outliers	101464	1066 (2.26-2.26)

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	574	<div> <div>2%</div> <div> <div></div> <div>44%</div> <div>26%</div> <div>•</div> <div>29%</div> </div> </div>
1	B	574	<div> <div>2%</div> <div> <div></div> <div>44%</div> <div>26%</div> <div>•</div> <div>29%</div> </div> </div>

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 6673 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.

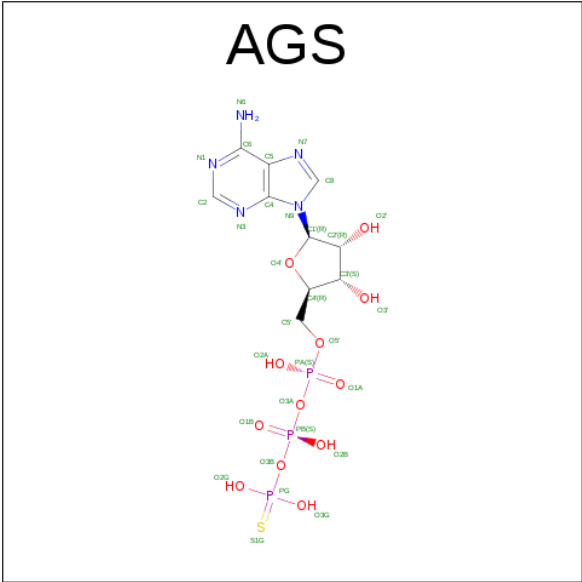
- Molecule 1 is a protein called DNA TRANSLOCASE FTSK.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	409	Total	C	N	O	S	0	0	1
			3122	1983	541	583	15			
1	B	409	Total	C	N	O	S	0	0	1
			3122	1983	541	583	15			

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	246	MET	-	EXPRESSION TAG	UNP Q9I0M3
A	812	LYS	-	EXPRESSION TAG	UNP Q9I0M3
A	813	LEU	-	EXPRESSION TAG	UNP Q9I0M3
A	814	HIS	-	EXPRESSION TAG	UNP Q9I0M3
A	815	HIS	-	EXPRESSION TAG	UNP Q9I0M3
A	816	HIS	-	EXPRESSION TAG	UNP Q9I0M3
A	817	HIS	-	EXPRESSION TAG	UNP Q9I0M3
A	818	HIS	-	EXPRESSION TAG	UNP Q9I0M3
A	819	HIS	-	EXPRESSION TAG	UNP Q9I0M3
B	246	MET	-	EXPRESSION TAG	UNP Q9I0M3
B	812	LYS	-	EXPRESSION TAG	UNP Q9I0M3
B	813	LEU	-	EXPRESSION TAG	UNP Q9I0M3
B	814	HIS	-	EXPRESSION TAG	UNP Q9I0M3
B	815	HIS	-	EXPRESSION TAG	UNP Q9I0M3
B	816	HIS	-	EXPRESSION TAG	UNP Q9I0M3
B	817	HIS	-	EXPRESSION TAG	UNP Q9I0M3
B	818	HIS	-	EXPRESSION TAG	UNP Q9I0M3
B	819	HIS	-	EXPRESSION TAG	UNP Q9I0M3

- Molecule 2 is PHOSPHOTHIOPHOSPHORIC ACID-ADENYLATE ESTER (three-letter code: AGS) (formula: C₁₀H₁₆N₅O₁₂P₃S).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	S	0	0
			31	10	5	12	3	1		
2	B	1	Total	C	N	O	P	S	0	0
			31	10	5	12	3	1		

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

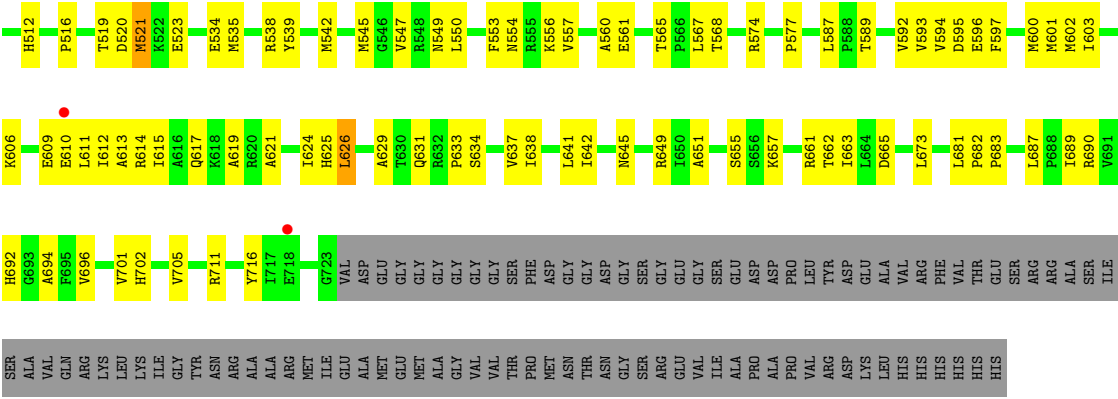
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	1	Total	Mg	0	0
			1	1		
3	A	1	Total	Mg	0	0
			1	1		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	172	Total	O	0	0
			172	172		
4	B	193	Total	O	0	0
			193	193		

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 ($\text{RSRZ} > 2$). 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.

L392	I395	I396	V397	R398	E401	V402	I403	F404	I413	P414	Q419	F423	V426	L441	L466	M469	P469	H461	V464	A465	G466	T467	T468	V474	L480	L481	L484	T488	P489	S490	R493	I497	D498	P499	K500	M501	L502	E503	L504	S505	I506	V507	E508												
PHE	VAL	ASP	THR	ALA	VAL	GLU	GLY	THR	L315	P316	P323	V326	K329	S330	Y331	P333	E334	S335	A338	R341	L342	L343	E344	I345	K346	L347	K348	E349	F350	G351	V352	E353	V354	S355	S358	V364	I365	E369	I370	A373	V376	K377	R378	S379	K380	S381									
MET	VAL	PRO	ASP	ARG	ARG	GLN	THR	LYS	ALA	LYS	GLU	ARG	LEU	LEU	GLU	ARG	GLU	LEU	ALA	LYS	HIS	MET	SER	GLU	ARG	GLU	LYS	ARG	PRO	PRO	PRO	LYS	ILE	ASP	PRO	PRO	PRO	SER	PRO	LYS	ALA	PRO	GLU	PRO	SER	LYS	VAL	LEU	LYS	GLU	LYS	GLN	ALA	PRO	LEU



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	46.17Å 57.43Å 98.06Å 94.57° 93.80° 107.66°	Depositor
Resolution (Å)	100.00 – 2.25 97.30 – 2.25	Depositor EDS
% Data completeness (in resolution range)	93.8 (100.00-2.25) 90.6 (97.30-2.25)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.31 (at 2.25Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.221 , 0.267 0.218 , 0.221	Depositor DCC
R_{free} test set	2145 reflections (5.33%)	DCC
Wilson B-factor (Å ²)	25.8	Xtriage
Anisotropy	0.336	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 61.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	6673	wwPDB-VP
Average B, all atoms (Å ²)	32.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 11.21% 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](#)

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

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	0.33	0/3178	0.64	0/4314
1	B	0.34	0/3178	0.65	1/4314 (0.0%)
All	All	0.34	0/6356	0.65	1/8628 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	502	LEU	N-CA-C	5.35	125.45	111.00

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	3122	0	3237	165	0
1	B	3122	0	3237	159	0
2	A	31	0	12	4	0
2	B	31	0	12	4	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	172	0	0	29	0
4	B	193	0	0	31	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	6673	0	6498	321	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 25.

The worst 5 of 321 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:329:LYS:HD3	1:A:329:LYS:H	1.20	1.06
1:A:329:LYS:HG2	1:A:330:SER:H	1.23	1.04
1:B:329:LYS:H	1:B:329:LYS:HD3	1.21	1.03
1:B:329:LYS:HG2	1:B:330:SER:H	1.21	1.03
1:A:554:ASN:HD21	1:A:587:LEU:H	1.04	1.01

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	407/574 (71%)	389 (96%)	13 (3%)	5 (1%)	15	11
1	B	407/574 (71%)	387 (95%)	15 (4%)	5 (1%)	15	11
All	All	814/1148 (71%)	776 (95%)	28 (3%)	10 (1%)	15	11

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	502	LEU
1	B	502	LEU
1	A	328	GLN
1	B	328	GLN

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Mol	Chain	Res	Type
1	A	503	GLU

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	346/481 (72%)	338 (98%)	8 (2%)	56	65
1	B	346/481 (72%)	336 (97%)	10 (3%)	48	57
All	All	692/962 (72%)	674 (97%)	18 (3%)	51	62

5 of 18 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	315	LEU
1	B	329	LYS
1	B	568	THR
1	A	626	LEU
1	A	641	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 12 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	645	ASN
1	A	666	GLN
1	B	583	GLN
1	A	625	HIS
1	B	554	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](#)

Of 4 ligands modelled in this entry, 2 are monoatomic - leaving 2 for Mogul analysis.

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$
2	AGS	A	1723	3	26,33,33	2.08	8 (30%)	22,52,52	1.35	3 (13%)
2	AGS	B	1724	3	26,33,33	2.17	8 (30%)	22,52,52	1.53	4 (18%)

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
2	AGS	A	1723	3	-	0/17/38/38	0/3/3/3
2	AGS	B	1724	3	-	0/17/38/38	0/3/3/3

The worst 5 of 16 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	1724	AGS	PG-S1G	-7.07	1.77	1.90
2	A	1723	AGS	PG-S1G	-5.69	1.79	1.90
2	A	1723	AGS	PG-O2G	-2.19	1.47	1.55
2	B	1724	AGS	PG-O2G	-2.19	1.47	1.55
2	B	1724	AGS	O5'-C5'	-2.09	1.36	1.44

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
2	B	1724	AGS	N3-C2-N1	-3.31	125.98	128.86
2	A	1723	AGS	N3-C2-N1	-2.88	126.35	128.86
2	B	1724	AGS	PB-O3B-PG	-2.42	124.52	132.35
2	A	1723	AGS	PB-O3B-PG	-2.30	124.93	132.35
2	B	1724	AGS	O2A-PA-O1A	2.03	122.76	112.28

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1723	AGS	4	0
2	B	1724	AGS	4	0

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	409/574 (71%)	0.07	13 (3%) 48 52	10, 30, 57, 97	0
1	B	409/574 (71%)	0.09	13 (3%) 48 52	11, 30, 57, 97	0
All	All	818/1148 (71%)	0.08	26 (3%) 48 52	10, 30, 57, 97	0

The worst 5 of 26 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	331	TYR	7.7
1	B	326	VAL	7.2
1	A	718	GLU	6.0
1	A	331	TYR	5.7
1	A	375	GLY	4.6

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
2	AGS	A	1723	31/31	0.96	0.13	-0.02	8,21,28,33	0
2	AGS	B	1724	31/31	0.97	0.13	-0.08	4,19,26,32	0
3	MG	A	1724	1/1	0.99	0.12	-	1,1,1,1	0
3	MG	B	1723	1/1	0.96	0.12	-	2,2,2,2	0

6.5 Other polymers [i](#)

There are no such residues in this entry.