



wwPDB X-ray Structure Validation Summary Report ⓘ

Nov 15, 2017 – 07:55 PM EST

PDB ID : 5IUJ
Title : Crystal structure of the DesK-DesR complex in the phosphotransfer state with low Mg²⁺ (20 mM)
Authors : Trajtenberg, F.; Imelio, J.A.; Larrieux, N.; Buschiazso, A.
Deposited on : unknown
Resolution : 3.20 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

<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 : rb-20030345
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) : rb-20030345

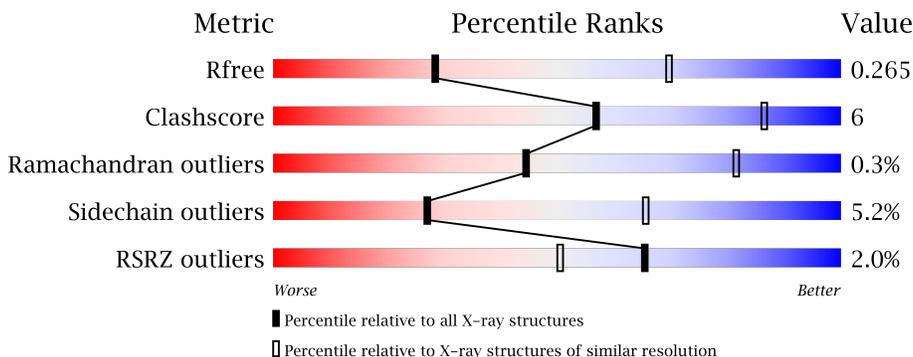
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.20 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}	100719	1015 (3.22-3.18)
Clashscore	112137	1009 (3.20-3.20)
Ramachandran outliers	110173	1118 (3.22-3.18)
Sidechain outliers	110143	1117 (3.22-3.18)
RSRZ outliers	101464	1020 (3.22-3.18)

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	218	 4% 85% 10% ..
1	B	218	 2% 83% 14% ..
1	D	218	 2% 84% 13% .
1	E	218	 2% 81% 17% ..
2	C	139	 73% 19% . 6%

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Mol	Chain	Length	Quality of chain
2	F	139	 <p>A horizontal bar chart representing the quality of the chain. The bar is divided into segments: a small red segment at the beginning, followed by a large green segment labeled '80%', a yellow segment labeled '16%', and a small grey segment at the end. A '%' symbol is positioned above the red segment, and a '.' symbol is positioned below the grey segment.</p>

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 9014 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 Sensor histidine kinase DesK.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	211	Total 1694	C 1055	N 300	O 332	S 7	0	0	0
1	B	215	Total 1726	C 1073	N 309	O 337	S 7	0	0	0
1	D	213	Total 1709	C 1062	N 305	O 335	S 7	0	0	0
1	E	215	Total 1722	C 1071	N 308	O 336	S 7	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	153	GLY	-	expression tag	UNP O34757
A	188	GLU	HIS	engineered mutation	UNP O34757
B	153	GLY	-	expression tag	UNP O34757
B	188	GLU	HIS	engineered mutation	UNP O34757
D	153	GLY	-	expression tag	UNP O34757
D	188	GLU	HIS	engineered mutation	UNP O34757
E	153	GLY	-	expression tag	UNP O34757
E	188	GLU	HIS	engineered mutation	UNP O34757

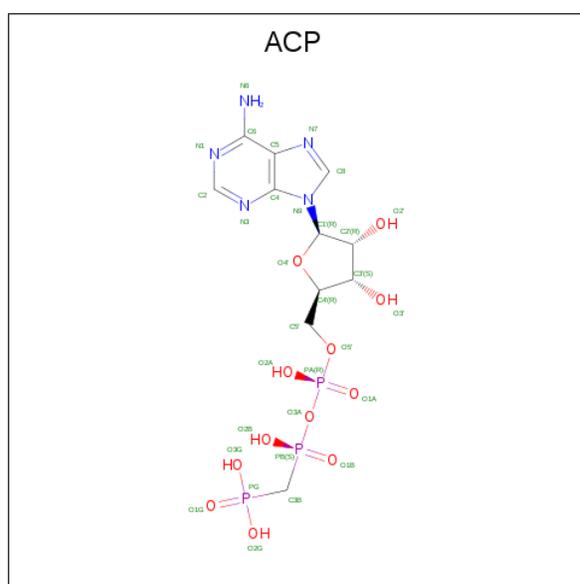
- Molecule 2 is a protein called Transcriptional regulatory protein DesR.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	131	Total 1000	C 632	N 164	O 195	S 9	0	0	0
2	F	133	Total 1018	C 644	N 166	O 199	S 9	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	-3	GLY	-	expression tag	UNP O34723
C	-2	SER	-	expression tag	UNP O34723
C	-1	GLY	-	expression tag	UNP O34723
C	0	SER	-	expression tag	UNP O34723
F	-3	GLY	-	expression tag	UNP O34723
F	-2	SER	-	expression tag	UNP O34723
F	-1	GLY	-	expression tag	UNP O34723
F	0	SER	-	expression tag	UNP O34723

- Molecule 3 is PHOSPHOMETHYLPHOSPHONIC ACID ADENYLATE ESTER (three-letter code: ACP) (formula: C₁₁H₁₈N₅O₁₂P₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	N	O			P
3	A	1	Total	C	N	O	P	0	0
			31	11	5	12	3		
3	B	1	Total	C	N	O	P	0	0
			31	11	5	12	3		
3	D	1	Total	C	N	O	P	0	0
			31	11	5	12	3		
3	E	1	Total	C	N	O	P	0	0
			31	11	5	12	3		

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	B	1	Total	Mg	0	0
			1	1		

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total Mg 1 1	0	0
4	D	1	Total Mg 1 1	0	0
4	E	1	Total Mg 1 1	0	0

- Molecule 5 is POTASSIUM ION (three-letter code: K) (formula: K).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	C	1	Total K 1 1	0	0
5	F	1	Total K 1 1	0	0

- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	4	Total O 4 4	0	0
6	B	2	Total O 2 2	0	0
6	C	3	Total O 3 3	0	0
6	D	3	Total O 3 3	0	0
6	E	1	Total O 1 1	0	0
6	F	2	Total O 2 2	0	0



- Molecule 2: Transcriptional regulatory protein DesR

Chain C: 73% 19% 6%



- Molecule 2: Transcriptional regulatory protein DesR

Chain F: 80% 16% 4%



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	87.82Å 114.62Å 91.60Å 90.00° 116.44° 90.00°	Depositor
Resolution (Å)	66.70 – 3.20 66.70 – 3.20	Depositor EDS
% Data completeness (in resolution range)	97.3 (66.70-3.20) 97.3 (66.70-3.20)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	0.11	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.89 (at 3.19Å)	Xtrriage
Refinement program	BUSTER-TNT 2.10.2	Depositor
R, R_{free}	0.187 , 0.240 0.204 , 0.265	Depositor DCC
R_{free} test set	1320 reflections (5.04%)	DCC
Wilson B-factor (Å ²)	77.9	Xtrriage
Anisotropy	0.545	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 76.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.27$	Xtrriage
Estimated twinning fraction	0.047 for h,-k,-h-l	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	9014	wwPDB-VP
Average B, all atoms (Å ²)	93.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.51% 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: K, ACP, MG

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	0.52	0/1708	0.73	0/2289
1	B	0.51	0/1741	0.76	0/2333
1	D	0.48	0/1723	0.71	0/2310
1	E	0.51	0/1737	0.75	0/2327
2	C	0.55	0/1011	0.76	0/1358
2	F	0.53	0/1030	0.75	0/1384
All	All	0.51	0/8950	0.74	0/12001

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 [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	1694	0	1741	15	0
1	B	1726	0	1777	25	0
1	D	1709	0	1749	22	0
1	E	1722	0	1774	28	0
2	C	1000	0	1028	20	0
2	F	1018	0	1042	15	0
3	A	31	0	14	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	31	0	14	2	0
3	D	31	0	14	0	0
3	E	31	0	14	1	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	D	1	0	0	0	0
4	E	1	0	0	0	0
5	C	1	0	0	0	0
5	F	1	0	0	0	0
6	A	4	0	0	0	0
6	B	2	0	0	0	0
6	C	3	0	0	0	0
6	D	3	0	0	0	0
6	E	1	0	0	0	0
6	F	2	0	0	0	0
All	All	9014	0	9167	104	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 6.

The worst 5 of 104 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:220:LEU:HD21	1:B:220:LEU:HD21	1.45	0.98
1:D:175:VAL:HG11	1:E:175:VAL:HG23	1.52	0.92
1:D:220:LEU:HD21	1:E:220:LEU:HD21	1.71	0.72
1:A:175:VAL:HG21	1:B:175:VAL:HG23	1.72	0.71
1:B:272:PRO:HD2	1:B:307:ILE:HG22	1.73	0.71

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	207/218 (95%)	204 (99%)	3 (1%)	0	100	100
1	B	213/218 (98%)	201 (94%)	11 (5%)	1 (0%)	32	74
1	D	209/218 (96%)	202 (97%)	7 (3%)	0	100	100
1	E	213/218 (98%)	206 (97%)	6 (3%)	1 (0%)	32	74
2	C	129/139 (93%)	126 (98%)	2 (2%)	1 (1%)	22	65
2	F	131/139 (94%)	127 (97%)	4 (3%)	0	100	100
All	All	1102/1150 (96%)	1066 (97%)	33 (3%)	3 (0%)	44	81

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	C	129	GLU
1	B	190	THR
1	E	239	SER

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	189/194 (97%)	180 (95%)	9 (5%)	30	68
1	B	192/194 (99%)	183 (95%)	9 (5%)	30	69
1	D	190/194 (98%)	186 (98%)	4 (2%)	59	85
1	E	191/194 (98%)	179 (94%)	12 (6%)	21	59
2	C	108/113 (96%)	99 (92%)	9 (8%)	13	46
2	F	110/113 (97%)	102 (93%)	8 (7%)	16	53
All	All	980/1002 (98%)	929 (95%)	51 (5%)	27	65

5 of 51 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	C	99	TYR
1	D	188	GLU

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Mol	Chain	Res	Type
2	F	23	LEU
2	C	129	GLU
1	D	196	SER

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 7 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	367	ASN
1	E	224	GLN
1	D	281	ASN
1	B	181	GLN
1	E	193	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 10 ligands modelled in this entry, 6 are monoatomic - leaving 4 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	$\# Z > 2$
3	ACP	A	401	4	27,33,33	0.93	3 (11%)	30,52,52	1.07	1 (3%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	ACP	B	401	4	27,33,33	1.17	3 (11%)	30,52,52	1.04	1 (3%)
3	ACP	D	401	4	27,33,33	0.94	3 (11%)	30,52,52	1.18	3 (10%)
3	ACP	E	401	4	27,33,33	1.03	3 (11%)	30,52,52	0.88	1 (3%)

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	ACP	A	401	4	-	0/15/38/38	0/3/3/3
3	ACP	B	401	4	-	0/15/38/38	0/3/3/3
3	ACP	D	401	4	-	0/15/38/38	0/3/3/3
3	ACP	E	401	4	-	0/15/38/38	0/3/3/3

The worst 5 of 12 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	401	ACP	PB-O2B	-2.92	1.49	1.56
3	E	401	ACP	PB-O2B	-2.57	1.50	1.56
3	B	401	ACP	PG-O3G	-2.11	1.49	1.54
3	A	401	ACP	PG-O3G	-2.07	1.50	1.54
3	E	401	ACP	PG-O3G	-2.04	1.50	1.54

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	401	ACP	O1G-PG-C3B	-2.46	105.79	111.22
3	B	401	ACP	O3G-PG-C3B	2.50	112.45	106.40
3	E	401	ACP	O2B-PB-C3B	2.57	117.47	106.54
3	D	401	ACP	O3G-PG-C3B	2.59	112.67	106.40
3	A	401	ACP	O1B-PB-C3B	3.36	117.28	108.97

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

3 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	401	ACP	2	0

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Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	401	ACP	2	0
3	E	401	ACP	1	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	211/218 (96%)	0.29	8 (3%) 41 27	43, 86, 146, 169	0
1	B	215/218 (98%)	0.42	5 (2%) 61 46	53, 94, 136, 180	0
1	D	213/218 (97%)	0.27	4 (1%) 67 52	48, 85, 148, 178	0
1	E	215/218 (98%)	0.40	4 (1%) 67 52	50, 87, 127, 183	0
2	C	131/139 (94%)	0.20	0 100 100	47, 83, 114, 136	0
2	F	133/139 (95%)	0.27	1 (0%) 86 77	56, 88, 124, 140	0
All	All	1118/1150 (97%)	0.32	22 (1%) 65 50	43, 87, 138, 183	0

The worst 5 of 22 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	331	PHE	5.3
1	B	331	PHE	5.1
1	A	332	SER	4.4
1	E	330	SER	4.3
1	B	307	ILE	3.4

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(Å ²)	Q<0.9
3	ACP	A	401	31/31	0.94	0.20	-0.81	113,123,132,132	0
3	ACP	B	401	31/31	0.95	0.20	-0.83	92,116,126,130	0
3	ACP	D	401	31/31	0.92	0.20	-0.97	120,133,152,154	0
3	ACP	E	401	31/31	0.97	0.17	-1.03	84,97,107,112	0
5	K	F	201	1/1	0.88	0.14	-3.14	97,97,97,97	0
5	K	C	201	1/1	0.89	0.09	-5.26	91,91,91,91	0
4	MG	B	402	1/1	0.96	0.06	-	93,93,93,93	0
4	MG	E	402	1/1	0.96	0.08	-	95,95,95,95	0
4	MG	D	402	1/1	0.90	0.10	-	212,212,212,212	1
4	MG	A	402	1/1	0.99	0.10	-	145,145,145,145	1

6.5 Other polymers [i](#)

There are no such residues in this entry.