



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 1, 2016 – 01:38 AM GMT

PDB ID : 2DR3  
Title : Crystal Structure of RecA superfamily ATPase PH0284 from *Pyrococcus horikoshii* OT3  
Authors : Bagautdinov, B.; Kunishima, N.; RIKEN Structural Genomics/Proteomics Initiative (RSGI)  
Deposited on : 2006-06-06  
Resolution : 2.00 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](mailto: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.

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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

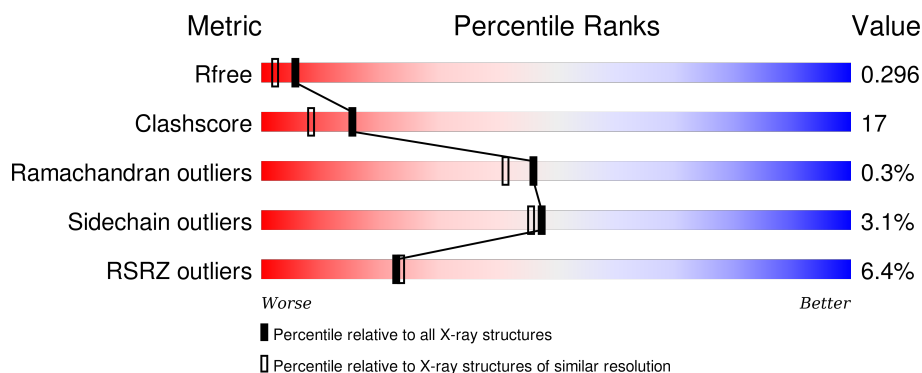
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.00 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	6249 (2.00-2.00)
Clashscore	102246	7340 (2.00-2.00)
Ramachandran outliers	100387	7248 (2.00-2.00)
Sidechain outliers	100360	7247 (2.00-2.00)
RSRZ outliers	91569	6262 (2.00-2.00)

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  $\geq 3$ , 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	247	<div> <div>6%</div> <div> <div></div> <div>60%</div> <div>33%</div> <div>• 6%</div> </div> </div>
1	B	247	<div> <div>3%</div> <div> <div></div> <div>71%</div> <div>24%</div> <div>• •</div> </div> </div>
1	C	247	<div> <div>2%</div> <div> <div></div> <div>69%</div> <div>23%</div> <div>• 6%</div> </div> </div>
1	D	247	<div> <div>11%</div> <div> <div></div> <div>64%</div> <div>33%</div> <div>• •</div> </div> </div>
1	E	247	<div> <div>7%</div> <div> <div></div> <div>66%</div> <div>28%</div> <div>• •</div> </div> </div>

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Mol	Chain	Length	Quality of chain
1	F	247	<div><div></div><div>8%</div><div>65%</div><div>28%</div><div></div><div></div></div>

## 2 Entry composition [i](#)

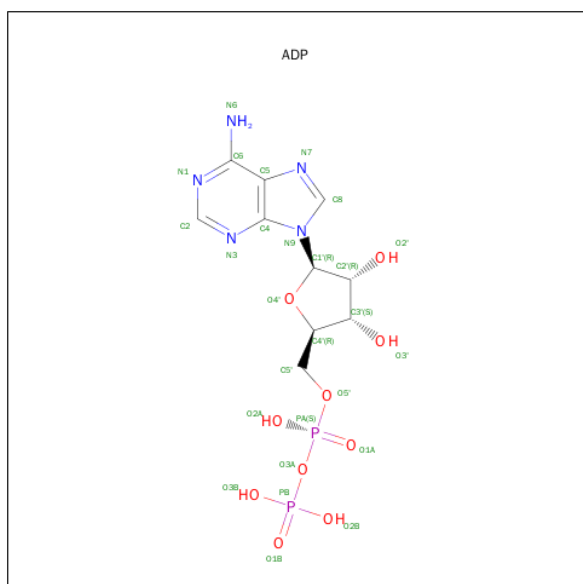
There are 3 unique types of molecules in this entry. The entry contains 12543 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 UPF0273 protein PH0284.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	232	Total	C	N	O	S	0	0	0
			1826	1167	323	328	8			
1	B	240	Total	C	N	O	S	0	0	0
			1875	1195	334	338	8			
1	C	233	Total	C	N	O	S	0	0	0
			1835	1171	324	332	8			
1	D	242	Total	C	N	O	S	0	0	0
			1896	1208	338	342	8			
1	E	236	Total	C	N	O	S	0	0	0
			1853	1184	328	333	8			
1	F	236	Total	C	N	O	S	0	0	0
			1854	1184	329	333	8			

- Molecule 2 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula:  $C_{10}H_{15}N_5O_{10}P_2$ ).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
2	B	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
2	C	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
2	D	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
2	E	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
2	F	1	Total	C	N	O	P	0	0
			27	10	5	10	2		

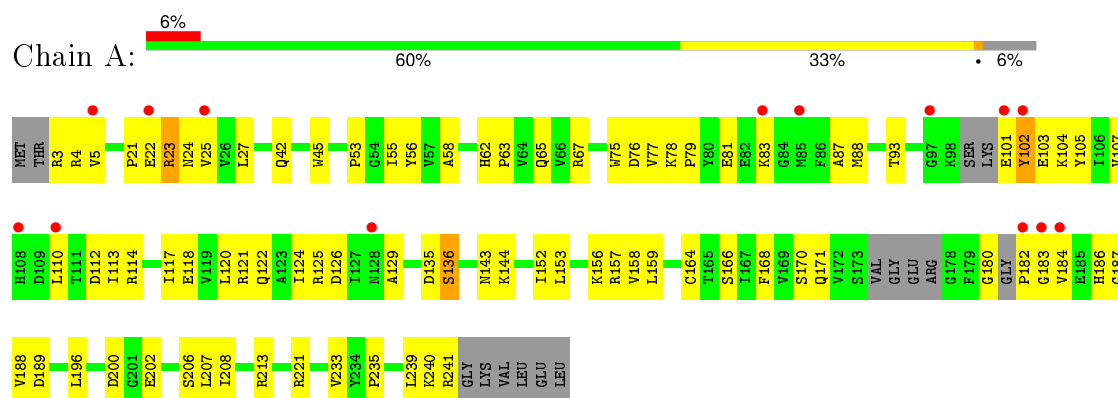
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	190	Total	O	0	0
			190	190		
3	B	220	Total	O	0	0
			220	220		
3	C	213	Total	O	0	0
			213	213		
3	D	228	Total	O	0	0
			228	228		
3	E	196	Total	O	0	0
			196	196		
3	F	195	Total	O	0	0
			195	195		

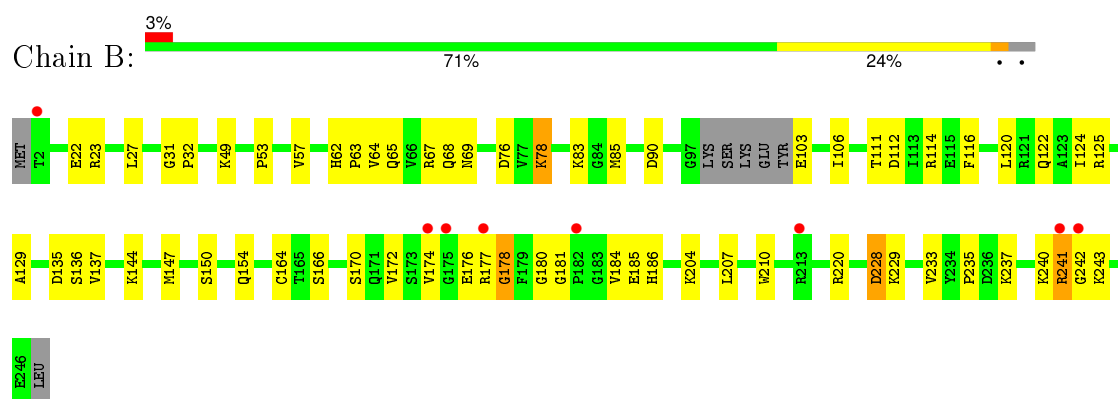
### 3 Residue-property plots

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.

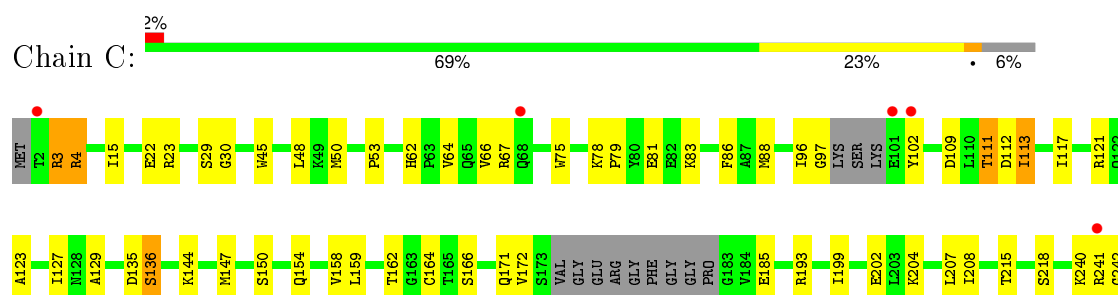
#### • Molecule 1: UPF0273 protein PH0284

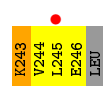


#### • Molecule 1: UPF0273 protein PH0284

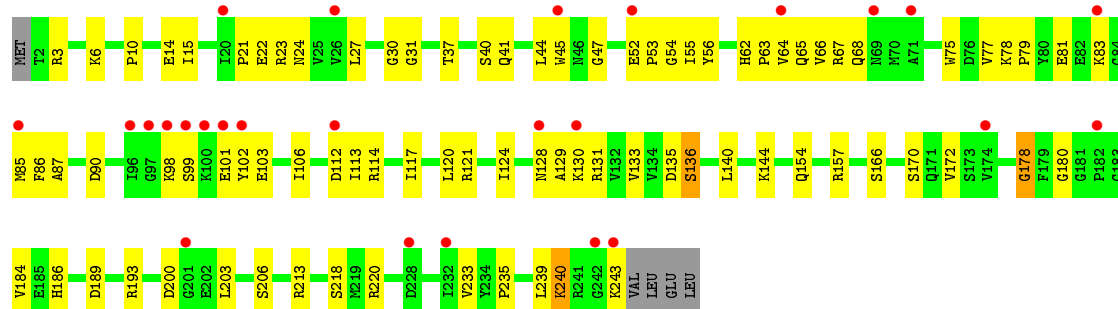


#### • Molecule 1: UPF0273 protein PH0284

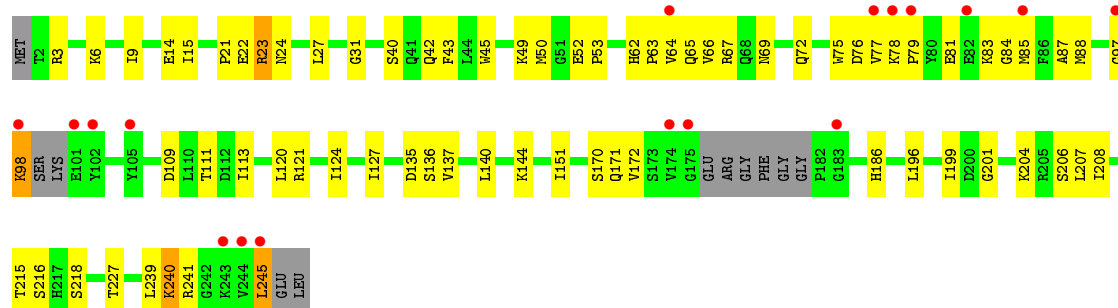




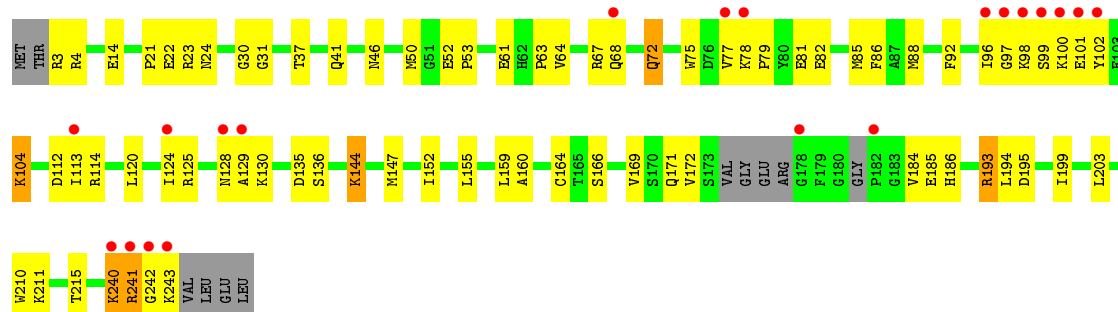
• Molecule 1: UPF0273 protein PH0284



• Molecule 1: UPF0273 protein PH0284



• Molecule 1: UPF0273 protein PH0284



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	96.06 Å 96.06 Å 298.90 Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	38.38 – 2.00 47.42 – 2.00	Depositor EDS
% Data completeness (in resolution range)	91.5 (38.38-2.00) 91.5 (47.42-2.00)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	0.10	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.40 (at 2.00 Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.251 , 0.295 0.252 , 0.296	Depositor DCC
$R_{free}$ test set	5013 reflections (5.03%)	DCC
Wilson B-factor (Å <sup>2</sup> )	37.7	Xtriage
Anisotropy	0.088	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 53.2	EDS
Estimated twinning fraction	0.007 for -h,-k,l	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.51$ , $\langle L^2 \rangle = 0.34$	Xtriage
Outliers	1 of 99706 reflections (0.001%)	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	12543	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	47.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.45% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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 [i](#)

### 5.1 Standard geometry [i](#)

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

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	0.40	0/1859	0.68	0/2502
1	B	0.41	0/1909	0.76	3/2573 (0.1%)
1	C	0.41	0/1867	0.70	0/2516
1	D	0.48	0/1932	0.72	1/2603 (0.0%)
1	E	0.42	0/1886	0.69	0/2541
1	F	0.48	1/1888 (0.1%)	0.71	1/2540 (0.0%)
All	All	0.43	1/11341 (0.0%)	0.71	5/15275 (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	D	0	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	F	75	TRP	NE1-CE2	8.57	1.48	1.37

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	125	ARG	NE-CZ-NH1	-12.66	113.97	120.30
1	B	125	ARG	NE-CZ-NH2	11.05	125.83	120.30
1	D	178	GLY	O-C-N	-5.98	113.13	122.70
1	B	178	GLY	O-C-N	-5.66	113.65	122.70
1	F	185	GLU	O-C-N	-5.10	114.55	122.70

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	D	178	GLY	Mainchain

## 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	1826	0	1867	80	0
1	B	1875	0	1923	52	0
1	C	1835	0	1881	64	0
1	D	1896	0	1944	71	0
1	E	1853	0	1908	66	0
1	F	1854	0	1902	77	0
2	A	27	0	12	0	0
2	B	27	0	12	0	0
2	C	27	0	12	0	0
2	D	27	0	12	0	0
2	E	27	0	12	0	0
2	F	27	0	12	0	0
3	A	190	0	0	5	0
3	B	220	0	0	11	0
3	C	213	0	0	6	0
3	D	228	0	0	10	0
3	E	196	0	0	11	0
3	F	195	0	0	9	0
All	All	12543	0	11497	395	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 17.

The worst 5 of 395 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:D:154:GLN:HA	1:D:157:ARG:HH12	1.08	1.11
1:C:240:LYS:HD3	1:C:245:LEU:HD12	1.31	1.07

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:104:LYS:HD2	1:F:104:LYS:H	1.21	1.03
1:D:124:ILE:HG23	1:D:129:ALA:HB3	1.49	0.94
1:C:243:LYS:HE3	1:C:243:LYS:HA	1.50	0.93

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	224/247 (91%)	217 (97%)	7 (3%)	0	100	100
1	B	236/247 (96%)	228 (97%)	7 (3%)	1 (0%)	39	33
1	C	227/247 (92%)	217 (96%)	10 (4%)	0	100	100
1	D	240/247 (97%)	228 (95%)	9 (4%)	3 (1%)	15	7
1	E	230/247 (93%)	221 (96%)	9 (4%)	0	100	100
1	F	230/247 (93%)	215 (94%)	15 (6%)	0	100	100
All	All	1387/1482 (94%)	1326 (96%)	57 (4%)	4 (0%)	46	41

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	184	VAL
1	D	103	GLU
1	D	180	GLY
1	B	180	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	197/209 (94%)	192 (98%)	5 (2%)	55	55
1	B	202/209 (97%)	195 (96%)	7 (4%)	43	40
1	C	199/209 (95%)	193 (97%)	6 (3%)	48	47
1	D	204/209 (98%)	198 (97%)	6 (3%)	50	49
1	E	201/209 (96%)	196 (98%)	5 (2%)	55	55
1	F	200/209 (96%)	192 (96%)	8 (4%)	38	33
All	All	1203/1254 (96%)	1166 (97%)	37 (3%)	47	46

5 of 37 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	136	SER
1	D	166	SER
1	F	193	ARG
1	C	243	LYS
1	D	112	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 9 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	46	ASN
1	F	72	GLN
1	D	69	ASN
1	B	186	HIS
1	D	68	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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](#)

6 ligands are 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
2	ADP	A	3801	-	22,29,29	1.05	1 (4%)	27,45,45	2.29	3 (11%)
2	ADP	B	3802	-	22,29,29	1.15	1 (4%)	27,45,45	2.22	4 (14%)
2	ADP	C	3803	-	22,29,29	0.93	0	27,45,45	2.23	2 (7%)
2	ADP	D	3804	-	22,29,29	1.15	1 (4%)	27,45,45	2.27	3 (11%)
2	ADP	E	3805	-	22,29,29	1.09	1 (4%)	27,45,45	2.17	3 (11%)
2	ADP	F	3806	-	22,29,29	1.13	1 (4%)	27,45,45	2.23	3 (11%)

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	ADP	A	3801	-	-	0/12/32/32	0/3/3/3
2	ADP	B	3802	-	-	0/12/32/32	0/3/3/3
2	ADP	C	3803	-	-	0/12/32/32	0/3/3/3
2	ADP	D	3804	-	-	0/12/32/32	0/3/3/3
2	ADP	E	3805	-	-	0/12/32/32	0/3/3/3
2	ADP	F	3806	-	-	0/12/32/32	0/3/3/3

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	3801	ADP	O4'-C1'	3.05	1.45	1.41
2	F	3806	ADP	O4'-C1'	3.18	1.45	1.41

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	3804	ADP	O4'-C1'	3.50	1.45	1.41
2	E	3805	ADP	O4'-C1'	3.59	1.45	1.41
2	B	3802	ADP	O4'-C1'	3.70	1.45	1.41

The worst 5 of 18 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	3803	ADP	N3-C2-N1	-10.50	120.86	128.89
2	A	3801	ADP	N3-C2-N1	-10.47	120.88	128.89
2	F	3806	ADP	N3-C2-N1	-10.42	120.92	128.89
2	D	3804	ADP	N3-C2-N1	-10.39	120.94	128.89
2	B	3802	ADP	N3-C2-N1	-10.31	121.00	128.89

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	232/247 (93%)	0.50	14 (6%) 25 27	27, 50, 77, 97	0
1	B	240/247 (97%)	0.20	8 (3%) 50 51	26, 40, 63, 78	0
1	C	233/247 (94%)	0.21	6 (2%) 59 60	24, 40, 64, 80	0
1	D	242/247 (97%)	0.68	26 (10%) 8 8	27, 49, 74, 93	0
1	E	236/247 (95%)	0.45	17 (7%) 18 20	23, 43, 66, 83	0
1	F	236/247 (95%)	0.48	20 (8%) 13 14	27, 44, 69, 92	0
All	All	1419/1482 (95%)	0.42	91 (6%) 23 24	23, 44, 71, 97	0

The worst 5 of 91 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	174	VAL	9.7
1	C	102	TYR	8.0
1	F	102	TYR	7.7
1	F	182	PRO	7.1
1	D	102	TYR	6.9

### 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
2	ADP	B	3802	27/27	0.91	0.16	1.33	36,55,63,63	0
2	ADP	D	3804	27/27	0.90	0.14	0.25	44,50,60,61	0
2	ADP	F	3806	27/27	0.93	0.12	-0.29	35,44,48,49	0
2	ADP	A	3801	27/27	0.95	0.10	-0.55	31,36,40,42	0
2	ADP	E	3805	27/27	0.96	0.10	-0.77	31,41,45,45	0
2	ADP	C	3803	27/27	0.97	0.10	-0.84	30,35,40,42	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.