



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 14, 2017 – 07:54 pm GMT

PDB ID : 4C7O  
Title : The structural basis of FtsY recruitment and GTPase activation by SRP RNA  
Authors : Voigts-Hoffmann, F.; Schmitz, N.; Shen, K.; Shan, S.O.; Ataide, S.F.; Ban, N.  
Deposited on : 2013-09-23  
Resolution : 2.60 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 : 1.7.2 (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

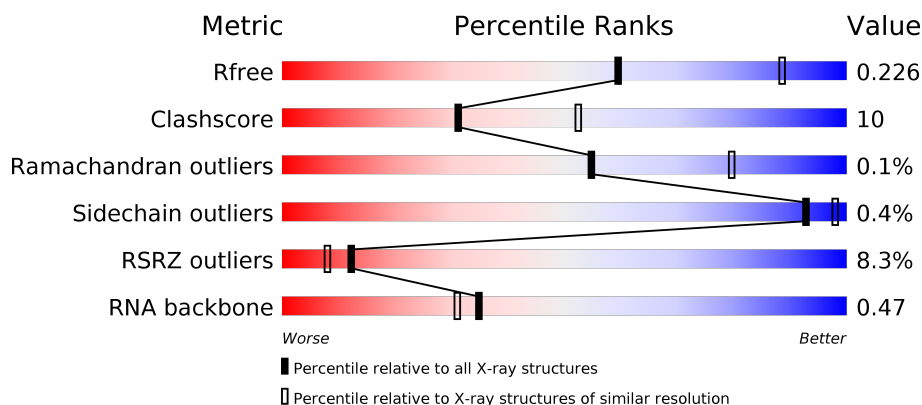
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.60 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	2542 (2.60-2.60)
Clashscore	112137	2895 (2.60-2.60)
Ramachandran outliers	110173	2848 (2.60-2.60)
Sidechain outliers	110143	2848 (2.60-2.60)
RSRZ outliers	101464	2550 (2.60-2.60)
RNA backbone	2435	1140 (3.00-2.20)

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  $\geq 3$ , 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	298	<div> <div>11%</div> <div> <div></div> <div>74%</div> <div>24%</div> <div></div> </div> </div>
1	C	298	<div> <div>7%</div> <div> <div></div> <div>80%</div> <div>19%</div> <div></div> </div> </div>
2	B	278	<div> <div>15%</div> <div> <div></div> <div>77%</div> <div>20%</div> <div></div> </div> </div>
2	D	278	<div> <div></div> <div> <div></div> <div>83%</div> <div>17%</div> <div></div> </div> </div>

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Mol	Chain	Length	Quality of chain
3	E	48	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	ALF	A	1001	-	-	X	-
4	ALF	C	1001	-	-	-	X
5	MG	A	1002	-	-	-	X

## 2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 10374 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 SIGNAL RECOGNITION PARTICLE PROTEIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	293	Total	C	N	O	S	0	0	0
			2233	1409	400	418	6			
1	C	297	Total	C	N	O	S	0	0	0
			2264	1429	404	424	7			

- Molecule 2 is a protein called SIGNAL RECOGNITION PARTICLE RECEPTOR FTSY.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	271	Total	C	N	O	S	0	0	0
			2067	1306	356	399	6			
2	D	277	Total	C	N	O	S	0	0	0
			2117	1337	367	407	6			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	26	GLY	-	EXPRESSION TAG	UNP P10121
B	27	LYS	-	EXPRESSION TAG	UNP P10121
B	28	LYS	-	EXPRESSION TAG	UNP P10121
B	29	ILE	-	EXPRESSION TAG	UNP P10121
D	26	GLY	-	EXPRESSION TAG	UNP P10121
D	27	LYS	-	EXPRESSION TAG	UNP P10121
D	28	LYS	-	EXPRESSION TAG	UNP P10121
D	29	ILE	-	EXPRESSION TAG	UNP P10121

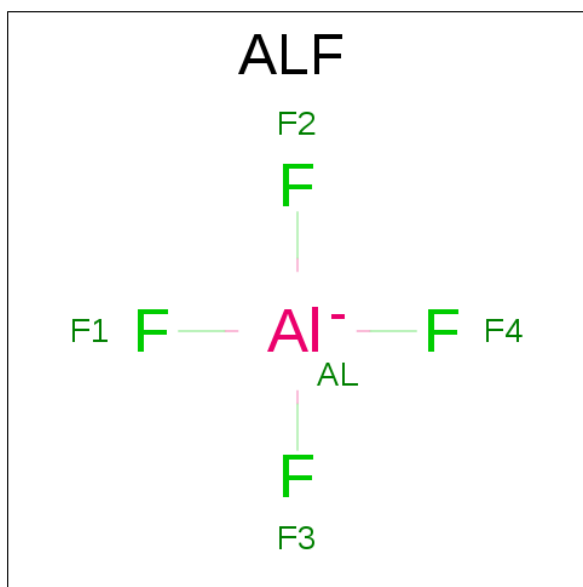
- Molecule 3 is a RNA chain called SRP RNA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	E	48	Total	C	N	O	P	0	0	0
			1028	457	183	340	48			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
E	21	G	-	LINKER	GB AE005174
E	22	A	-	LINKER	GB AE005174
E	23	A	-	LINKER	GB AE005174
E	24	G	-	LINKER	GB AE005174

- Molecule 4 is TETRAFLUOROALUMINATE ION (three-letter code: ALF) (formula:  $\text{AlF}_4$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	Al	F	0	0
			5	1	4		
4	B	1	Total	Al	F	0	0
			5	1	4		
4	C	1	Total	Al	F	0	0
			5	1	4		
4	D	1	Total	Al	F	0	0
			5	1	4		

- Molecule 5 is MAGNESIUM ION (three-letter code: MG) (formula:  $\text{Mg}$ ).

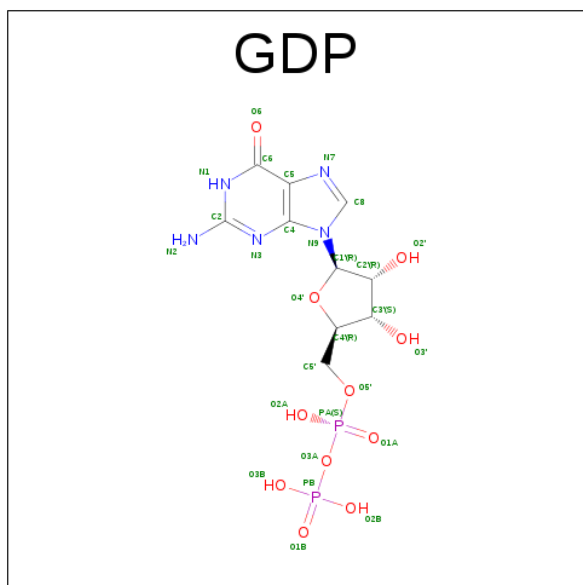
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	B	1	Total	Mg	0	0
			1	1		
5	A	1	Total	Mg	0	0
			1	1		
5	D	1	Total	Mg	0	0
			1	1		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	C	1	Total	Mg	0	0
			1	1		

- Molecule 6 is GUANOSINE-5'-DIPHOSPHATE (three-letter code: GDP) (formula:  $C_{10}H_{15}N_5O_{11}P_2$ ).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
6	A	1	Total	C	N	O	P	0	0
			28	10	5	11	2		
6	B	1	Total	C	N	O	P	0	0
			28	10	5	11	2		
6	C	1	Total	C	N	O	P	0	0
			28	10	5	11	2		
6	D	1	Total	C	N	O	P	0	0
			28	10	5	11	2		
6	D	1	Total	C	N	O	P	0	0
			28	10	5	11	2		

- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	80	Total	O	0	0
			80	80		
7	B	79	Total	O	0	0
			79	79		
7	C	136	Total	O	0	0
			136	136		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	D	144	Total 144	O 144	0	0
7	E	62	Total 62	O 62	0	0

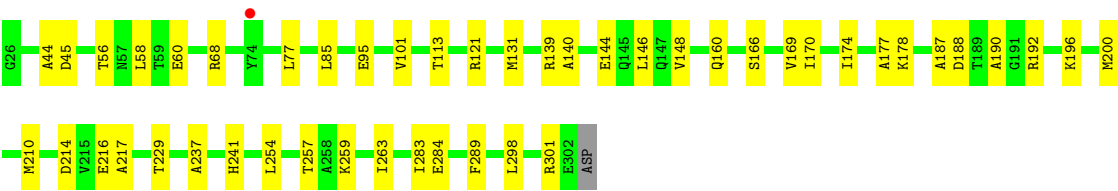




Chain D: 

83%

17%



• Molecule 3: SRP RNA

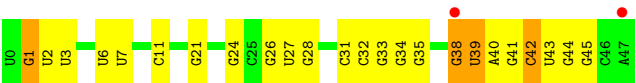
Chain E: 

4%

50%

42%

8%



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	56.72Å 166.33Å 154.59Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.22 – 2.60 49.22 – 2.60	Depositor EDS
% Data completeness (in resolution range)	99.3 (49.22-2.60) 99.3 (49.22-2.60)	Depositor EDS
$R_{merge}$	0.05	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.54 (at 2.61Å)	Xtriage
Refinement program	PHENIX (PHENIX.REFINE)	Depositor
R, $R_{free}$	0.163 , 0.226 0.165 , 0.226	Depositor DCC
$R_{free}$ test set	1852 reflections (4.06%)	DCC
Wilson B-factor (Å <sup>2</sup> )	62.0	Xtriage
Anisotropy	0.399	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.29 , 58.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	10374	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	87.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.67% 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, 0.333 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: GDP, ALF, 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	0.42	0/2262	0.63	0/3057
1	C	0.50	0/2294	0.67	0/3099
2	B	0.44	0/2091	0.63	1/2822 (0.0%)
2	D	0.52	0/2141	0.66	0/2886
3	E	0.50	0/1148	1.00	0/1789
All	All	0.48	0/9936	0.71	1/13653 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	200	MET	CG-SD-CE	-5.13	92.00	100.20

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	2233	0	2324	60	0
1	C	2264	0	2349	51	0
2	B	2067	0	2114	41	0
2	D	2117	0	2173	37	0
3	E	1028	0	518	16	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	A	5	0	0	2	0
4	B	5	0	0	0	0
4	C	5	0	0	1	0
4	D	5	0	0	0	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
5	C	1	0	0	0	0
5	D	1	0	0	0	0
6	A	28	0	12	0	0
6	B	28	0	12	2	0
6	C	28	0	12	0	0
6	D	56	0	24	0	0
7	A	80	0	0	10	0
7	B	79	0	0	6	0
7	C	136	0	0	8	0
7	D	144	0	0	2	0
7	E	62	0	0	4	0
All	All	10374	0	9538	200	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 10.

The worst 5 of 200 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)
2:D:139:ARG:NH1	2:D:140:ALA:O	2.08	0.86
1:C:141:ARG:NH1	7:C:2069:HOH:O	2.03	0.82
1:C:50:GLU:OE1	1:C:264:HIS:NE2	2.12	0.82
2:B:180:ARG:NH1	3:E:45:G:OP1	2.13	0.81
1:C:35:ARG:HB2	1:C:52:ILE:HD11	1.65	0.78

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	291/298 (98%)	274 (94%)	16 (6%)	1 (0%)	44	70
1	C	295/298 (99%)	279 (95%)	16 (5%)	0	100	100
2	B	269/278 (97%)	260 (97%)	9 (3%)	0	100	100
2	D	275/278 (99%)	267 (97%)	8 (3%)	0	100	100
All	All	1130/1152 (98%)	1080 (96%)	49 (4%)	1 (0%)	55	79

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	65	ASN

### 5.3.2 Protein sidechains ⓘ

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	239/243 (98%)	238 (100%)	1 (0%)	93	98
1	C	242/243 (100%)	241 (100%)	1 (0%)	93	98
2	B	217/223 (97%)	216 (100%)	1 (0%)	91	97
2	D	222/223 (100%)	221 (100%)	1 (0%)	91	97
All	All	920/932 (99%)	916 (100%)	4 (0%)	93	98

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	62	HIS
2	B	126	GLN
1	C	141	ARG
2	D	284	GLU

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	62	HIS

### 5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
3	E	47/48 (97%)	11 (23%)	0

5 of 11 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
3	E	1	G
3	E	21	G
3	E	24	G
3	E	26	G
3	E	27	U

There are no RNA pucker outliers to report.

## 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 13 ligands modelled in this entry, 4 are monoatomic - leaving 9 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	$\# Z  > 2$
4	ALF	A	1001	5,7,6	0,4,4	0.00	-	0,6,6	0.00	-

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
6	GDP	A	1003	5,4	25,30,30	1.18	2 (8%)	26,47,47	2.08	9 (34%)
4	ALF	B	1001	7,6	0,4,4	0.00	-	0,6,6	0.00	-
6	GDP	B	1003	5,4	25,30,30	1.21	2 (8%)	26,47,47	2.18	7 (26%)
4	ALF	C	1001	5,7,6	0,4,4	0.00	-	0,6,6	0.00	-
6	GDP	C	1003	5,4	25,30,30	1.15	2 (8%)	26,47,47	2.33	9 (34%)
4	ALF	D	1001	7,6	0,4,4	0.00	-	0,6,6	0.00	-
6	GDP	D	1003	5,4	25,30,30	1.10	3 (12%)	26,47,47	2.14	7 (26%)
6	GDP	D	1306	-	25,30,30	1.19	3 (12%)	26,47,47	2.02	6 (23%)

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
4	ALF	A	1001	5,7,6	-	0/0/0/0	0/0/0/0
6	GDP	A	1003	5,4	-	0/12/32/32	0/3/3/3
4	ALF	B	1001	7,6	-	0/0/0/0	0/0/0/0
6	GDP	B	1003	5,4	-	0/12/32/32	0/3/3/3
4	ALF	C	1001	5,7,6	-	0/0/0/0	0/0/0/0
6	GDP	C	1003	5,4	-	0/12/32/32	0/3/3/3
4	ALF	D	1001	7,6	-	0/0/0/0	0/0/0/0
6	GDP	D	1003	5,4	-	0/12/32/32	0/3/3/3
6	GDP	D	1306	-	-	0/12/32/32	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)
6	C	1003	GDP	C2'-C1'	-2.19	1.50	1.53
6	B	1003	GDP	C5-C4	2.09	1.45	1.40
6	D	1306	GDP	O4'-C1'	2.10	1.44	1.41
6	D	1003	GDP	C5-C4	2.26	1.45	1.40
6	A	1003	GDP	C5-C4	2.38	1.45	1.40

The worst 5 of 38 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	1003	GDP	C6-C5-C4	-4.82	116.05	120.84
6	C	1003	GDP	C6-C5-C4	-4.52	116.35	120.84
6	D	1003	GDP	C6-C5-C4	-4.32	116.54	120.84
6	B	1003	GDP	C5-C6-N1	-4.25	117.44	123.48

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	D	1003	GDP	C5-C6-N1	-4.16	117.55	123.48

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
4	A	1001	ALF	2	0
6	B	1003	GDP	2	0
4	C	1001	ALF	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, 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	293/298 (98%)	0.22	32 (10%) 6 4	39, 82, 198, 237	0
1	C	297/298 (99%)	0.02	22 (7%) 15 11	36, 60, 178, 247	0
2	B	271/278 (97%)	0.42	42 (15%) 2 1	40, 88, 199, 227	0
2	D	277/278 (99%)	-0.34	1 (0%) 92 91	37, 56, 105, 134	0
3	E	48/48 (100%)	-0.50	2 (4%) 37 29	52, 102, 204, 228	0
All	All	1186/1200 (98%)	0.06	99 (8%) 12 8	36, 71, 190, 247	0

The worst 5 of 99 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	15	ASN	13.4
1	C	19	ARG	9.9
1	A	15	ASN	8.6
2	B	74	TYR	8.0
1	C	16	ILE	8.0

### 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, 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
5	MG	A	1002	1/1	0.94	0.18	3.14	50,50,50,50	0
4	ALF	C	1001	5/5	0.99	0.18	2.10	45,47,57,66	0
4	ALF	A	1001	5/5	0.99	0.18	1.87	45,50,63,75	0
5	MG	D	1002	1/1	0.96	0.18	1.58	36,36,36,36	0
5	MG	C	1002	1/1	0.97	0.15	1.51	45,45,45,45	0
4	ALF	B	1001	5/5	0.99	0.18	0.99	38,40,52,62	0
6	GDP	B	1003	28/28	0.99	0.16	0.68	37,52,60,61	0
6	GDP	D	1003	28/28	0.99	0.18	0.67	28,40,46,56	0
6	GDP	A	1003	28/28	0.99	0.17	0.53	28,40,45,48	0
6	GDP	C	1003	28/28	0.99	0.17	0.26	27,37,47,54	0
4	ALF	D	1001	5/5	0.99	0.15	-0.66	29,38,43,57	0
6	GDP	D	1306	28/28	0.95	0.14	-0.79	73,84,107,108	0
5	MG	B	1002	1/1	0.99	0.13	-2.05	43,43,43,43	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.