



## wwPDB/EMDataBank EM Map/Model Validation Summary Report ⓘ

Mar 27, 2019 – 10:32 PM EDT

PDB ID : 6D00  
EMDB ID: : EMD-7782  
Title : Calcarisporiella thermophila Hsp104  
Authors : Zhang, K.; Pintilie, G.  
Deposited on : 2018-04-09  
Resolution : 4.00 Å(reported)

This is a wwPDB/EMDataBank EM Map/Model Validation Summary Report  
for a publicly released PDB/EMDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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MolProbity : 4.02b-467  
Mogul : 1.8.0 (224370), CSD as540be (2019)  
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)  
Validation Pipeline (wwPDB-VP) : rb-20031633

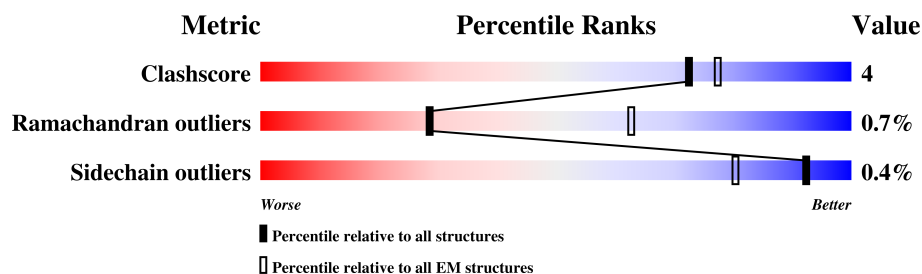
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 4.00 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)	EM structures (#Entries)
Clashscore	136327	1886
Ramachandran outliers	132723	1663
Sidechain outliers	132532	1531

The table below summarises the geometric issues observed across the polymeric chains. The red, orange, yellow and green segments on the 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  $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	1	883	81% 10% 9%
1	2	883	80% 11% 9%
1	3	883	80% 11% 9%
1	4	883	81% 10% 9%
1	5	883	80% 11% 9%
1	6	883	81% 10% 9%

## 2 Entry composition [i](#)

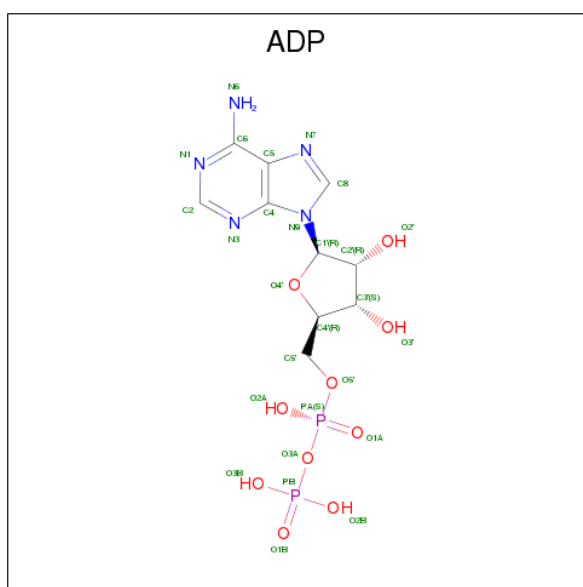
There are 2 unique types of molecules in this entry. The entry contains 38328 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 *Calcarisporiella thermophila* Hsp104.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	1	804	Total	C	N	O	S	0	0
			6334	3965	1150	1194	25		
1	2	804	Total	C	N	O	S	0	0
			6334	3965	1150	1194	25		
1	3	804	Total	C	N	O	S	0	0
			6334	3965	1150	1194	25		
1	4	804	Total	C	N	O	S	0	0
			6334	3965	1150	1194	25		
1	5	804	Total	C	N	O	S	0	0
			6334	3965	1150	1194	25		
1	6	804	Total	C	N	O	S	0	0
			6334	3965	1150	1194	25		

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

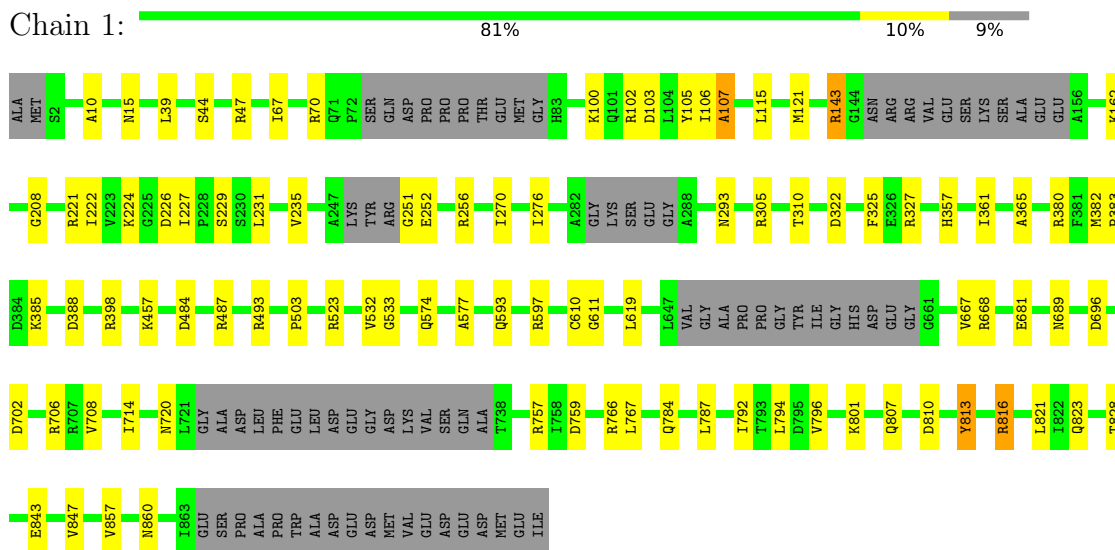


Mol	Chain	Residues	Atoms					AltConf
2	1	1	Total	C	N	O	P	0
			54	20	10	20	4	
2	1	1	Total	C	N	O	P	0
			54	20	10	20	4	
2	2	1	Total	C	N	O	P	0
			54	20	10	20	4	
2	2	1	Total	C	N	O	P	0
			54	20	10	20	4	
2	3	1	Total	C	N	O	P	0
			54	20	10	20	4	
2	3	1	Total	C	N	O	P	0
			54	20	10	20	4	
2	4	1	Total	C	N	O	P	0
			54	20	10	20	4	
2	4	1	Total	C	N	O	P	0
			54	20	10	20	4	
2	5	1	Total	C	N	O	P	0
			54	20	10	20	4	
2	5	1	Total	C	N	O	P	0
			54	20	10	20	4	
2	6	1	Total	C	N	O	P	0
			54	20	10	20	4	
2	6	1	Total	C	N	O	P	0
			54	20	10	20	4	

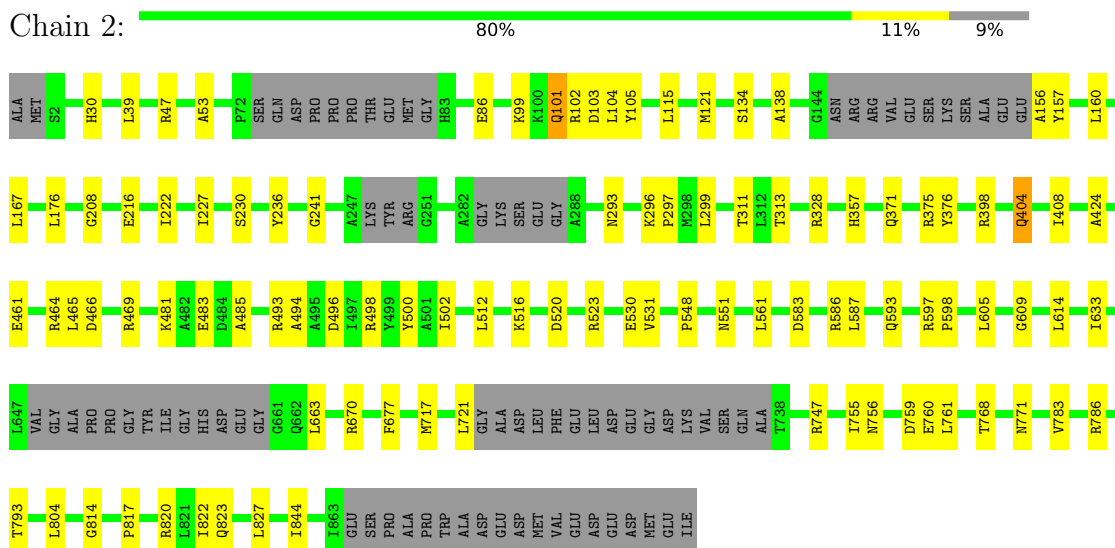
### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. 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. 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: *Calcarisporiella thermophila* Hsp104

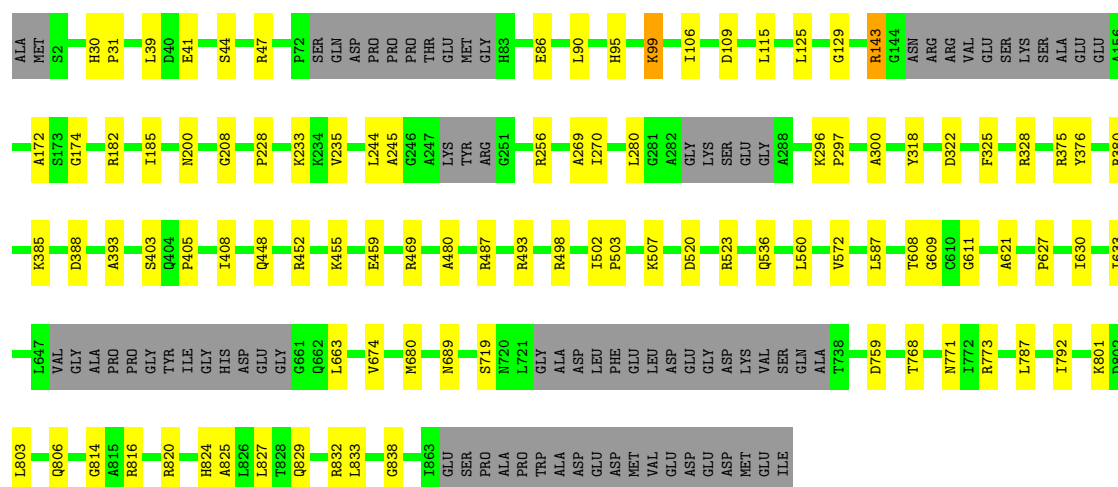


- Molecule 1: *Calcarisporiella thermophila* Hsp104




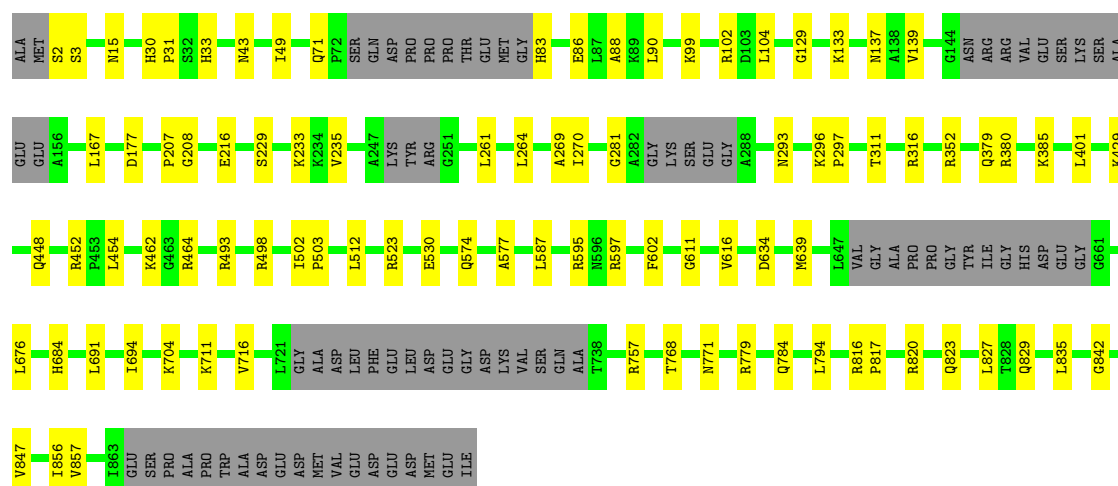
- Molecule 1: *Calcarisporiella thermophila* Hsp104

Chain 3: 




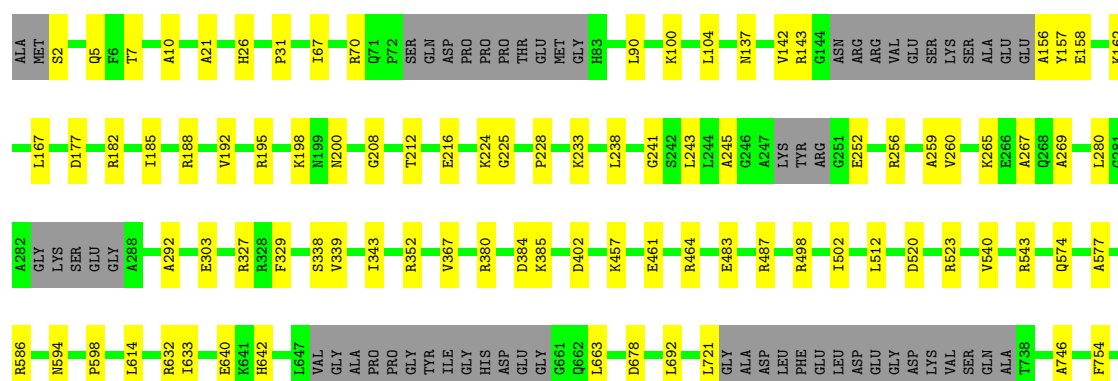
• Molecule 1: *Calcarisporiella thermophila* Hsp104

Chain 4: 



• Molecule 1: *Calcarisporiella thermophila* Hsp104

Chain 5: 





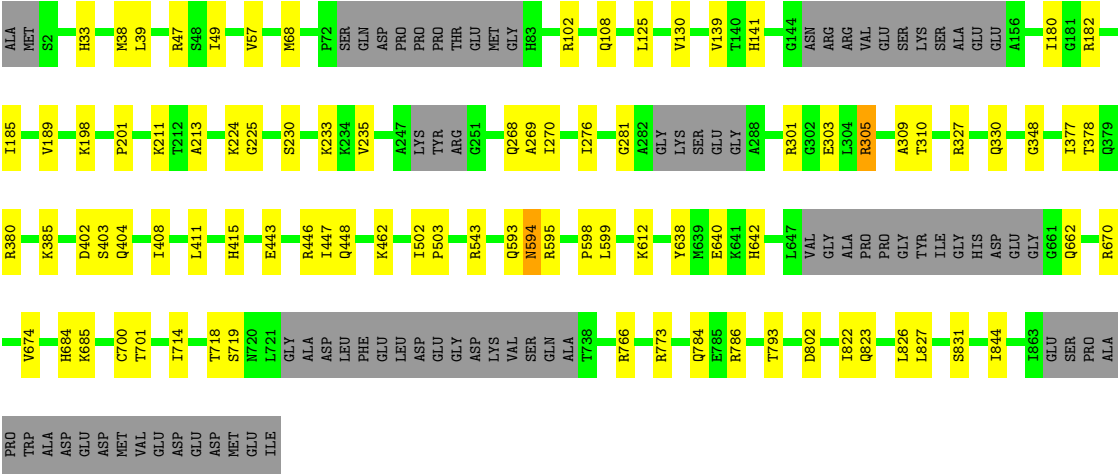
● Molecule 1: Calcarisporiella thermophila Hsp104

Chain 6: 

81%

10%

9%



## 4 Experimental information

Property	Value	Source
Reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	224915	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION; Gctf	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	31.8	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	130000	Depositor
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor

## 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  >2	RMSZ	# Z  >2
1	1	0.22	0/6411	0.38	0/8631
1	2	0.23	0/6411	0.37	0/8631
1	3	0.22	0/6411	0.37	0/8631
1	4	0.22	0/6411	0.37	0/8631
1	5	0.22	0/6411	0.37	0/8631
1	6	0.22	0/6411	0.37	0/8631
All	All	0.22	0/38466	0.37	0/51786

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	1	6334	0	6497	53	0
1	2	6334	0	6497	58	0
1	3	6334	0	6497	56	0
1	4	6334	0	6497	49	0
1	5	6334	0	6497	56	0
1	6	6334	0	6497	50	0
2	1	54	0	24	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	2	54	0	24	3	0
2	3	54	0	24	3	0
2	4	54	0	24	1	0
2	5	54	0	24	2	0
2	6	54	0	24	2	0
All	All	38328	0	39126	287	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 4.

The worst 5 of 287 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)
1:2:156:ALA:N	1:2:236:TYR:HH	1.72	0.88
1:3:106:ILE:HG13	1:4:102:ARG:HH21	1.58	0.69
1:1:816:ARG:HH21	1:6:303:GLU:HG2	1.61	0.65
1:4:784:GLN:HE22	1:4:794:LEU:H	1.42	0.65
1:6:404:GLN:HE21	1:6:408:ILE:HG22	1.62	0.64

There are no symmetry-related clashes.

## 5.3 Torsion angles ⓘ

### 5.3.1 Protein backbone ⓘ

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

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	1	790/883 (90%)	716 (91%)	66 (8%)	8 (1%)	17	58
1	2	790/883 (90%)	740 (94%)	44 (6%)	6 (1%)	21	63
1	3	790/883 (90%)	732 (93%)	53 (7%)	5 (1%)	27	68
1	4	790/883 (90%)	747 (95%)	38 (5%)	5 (1%)	27	68
1	5	790/883 (90%)	736 (93%)	50 (6%)	4 (0%)	31	72

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	6	790/883 (90%)	729 (92%)	57 (7%)	4 (0%)	31	72
All	All	4740/5298 (90%)	4400 (93%)	308 (6%)	32 (1%)	28	65

5 of 32 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	1	103	ASP
1	2	101	GLN
1	2	105	TYR
1	6	224	LYS
1	1	611	GLY

### 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 PDB entries followed by that with respect to all EM entries.

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	1	679/742 (92%)	675 (99%)	4 (1%)	87	94
1	2	679/742 (92%)	678 (100%)	1 (0%)	94	97
1	3	679/742 (92%)	677 (100%)	2 (0%)	93	96
1	4	679/742 (92%)	676 (100%)	3 (0%)	92	96
1	5	679/742 (92%)	678 (100%)	1 (0%)	94	97
1	6	679/742 (92%)	674 (99%)	5 (1%)	85	93
All	All	4074/4452 (92%)	4058 (100%)	16 (0%)	92	96

5 of 16 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	4	15	ASN
1	4	43	ASN
1	6	327	ARG
1	3	493	ARG
1	6	543	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 39 such sidechains are listed below:

Mol	Chain	Res	Type
1	3	200	ASN
1	4	43	ASN
1	6	684	HIS
1	3	806	GLN
1	3	829	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 ⓘ

There are no carbohydrates in this entry.

### 5.6 Ligand geometry ⓘ

12 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	1	901	-	24,29,29	1.02	1 (4%)	25,45,45	1.35	3 (12%)
2	ADP	1	902	-	24,29,29	1.02	1 (4%)	25,45,45	1.43	3 (12%)
2	ADP	2	901	-	24,29,29	1.03	1 (4%)	25,45,45	1.36	3 (12%)
2	ADP	2	902	-	24,29,29	1.02	1 (4%)	25,45,45	1.44	3 (12%)
2	ADP	3	901	-	24,29,29	1.03	1 (4%)	25,45,45	1.36	3 (12%)
2	ADP	3	902	-	24,29,29	1.02	1 (4%)	25,45,45	1.44	3 (12%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	ADP	4	901	-	24,29,29	1.02	1 (4%)	25,45,45	1.38	3 (12%)
2	ADP	4	902	-	24,29,29	1.02	1 (4%)	25,45,45	1.42	3 (12%)
2	ADP	5	901	-	24,29,29	1.02	1 (4%)	25,45,45	1.39	3 (12%)
2	ADP	5	902	-	24,29,29	1.02	1 (4%)	25,45,45	1.43	3 (12%)
2	ADP	6	901	-	24,29,29	1.01	1 (4%)	25,45,45	1.35	3 (12%)
2	ADP	6	902	-	24,29,29	1.01	1 (4%)	25,45,45	1.43	3 (12%)

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	1	901	-	-	0/12/32/32	0/3/3/3
2	ADP	1	902	-	-	0/12/32/32	0/3/3/3
2	ADP	2	901	-	-	0/12/32/32	0/3/3/3
2	ADP	2	902	-	-	0/12/32/32	0/3/3/3
2	ADP	3	901	-	-	0/12/32/32	0/3/3/3
2	ADP	3	902	-	-	0/12/32/32	0/3/3/3
2	ADP	4	901	-	-	0/12/32/32	0/3/3/3
2	ADP	4	902	-	-	0/12/32/32	0/3/3/3
2	ADP	5	901	-	-	0/12/32/32	0/3/3/3
2	ADP	5	902	-	-	0/12/32/32	0/3/3/3
2	ADP	6	901	-	-	0/12/32/32	0/3/3/3
2	ADP	6	902	-	-	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)
2	6	901	ADP	C5-C4	3.09	1.47	1.40
2	4	902	ADP	C5-C4	3.10	1.47	1.40
2	5	901	ADP	C5-C4	3.10	1.47	1.40
2	3	902	ADP	C5-C4	3.11	1.47	1.40
2	6	902	ADP	C5-C4	3.11	1.47	1.40

The worst 5 of 36 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	2	902	ADP	PA-O3A-PB	-3.76	120.62	132.57
2	3	902	ADP	PA-O3A-PB	-3.71	120.77	132.57
2	5	902	ADP	PA-O3A-PB	-3.69	120.86	132.57

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	1	902	ADP	PA-O3A-PB	-3.68	120.88	132.57
2	4	902	ADP	PA-O3A-PB	-3.66	120.95	132.57

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

7 monomers are involved in 11 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	2	901	ADP	1	0
2	2	902	ADP	2	0
2	3	902	ADP	3	0
2	4	902	ADP	1	0
2	5	901	ADP	1	0
2	5	902	ADP	1	0
2	6	901	ADP	2	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.