



# wwPDB X-ray Structure Validation Summary Report ⓘ

May 27, 2024 – 08:53 PM EDT

PDB ID : 6MDZ  
Title : Human Argonaute2-miR-122 bound to a target RNA with two central mismatches (bu2)  
Authors : Sheu-Gruttadauria, J.; MacRae, I.J.  
Deposited on : 2018-09-05  
Resolution : 3.40 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

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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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 : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.36.2  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36.2

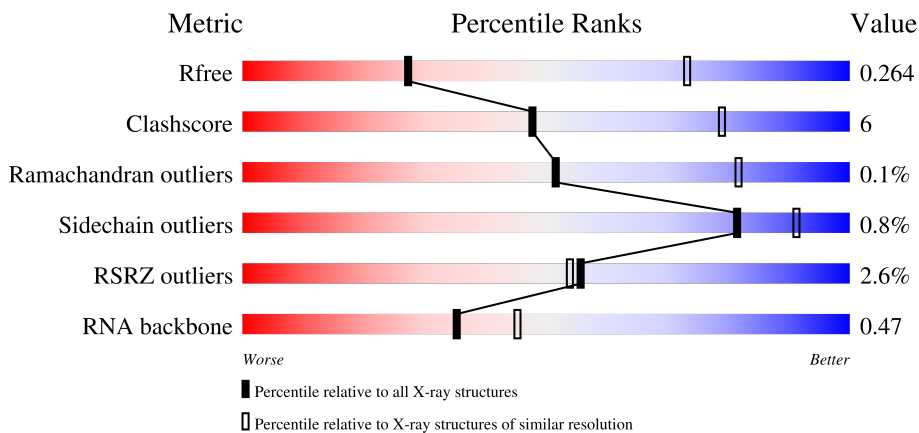
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.40 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.



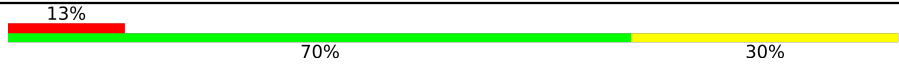

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	1026 (3.48-3.32)
Clashscore	141614	1055 (3.48-3.32)
Ramachandran outliers	138981	1038 (3.48-3.32)
Sidechain outliers	138945	1038 (3.48-3.32)
RSRZ outliers	127900	2173 (3.50-3.30)
RNA backbone	3102	1006 (3.84-2.96)

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 of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. 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	859	 2% 78% 15% 6%
1	B	859	 2% 77% 16% 7%
2	C	21	 43% 29% 24% 5%
2	D	21	 14% 19% 33% 14% 33%

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Mol	Chain	Length	Quality of chain
3	E	23	 <p>13% 70% 30%</p>
3	F	23	 <p>4% 61% 9% 26%</p>

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 14382 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 Protein argonaute-2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	804	Total 6446	C 4106	N 1158	O 1141	S 41	0	0	0
1	B	796	Total 6388	C 4073	N 1148	O 1128	S 39	0	0	0

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	387	ASP	SER	engineered mutation	UNP Q9UKV8
A	669	ALA	ASP	engineered mutation	UNP Q9UKV8
A	824	ALA	SER	engineered mutation	UNP Q9UKV8
A	828	ASP	SER	engineered mutation	UNP Q9UKV8
A	831	ASP	SER	engineered mutation	UNP Q9UKV8
A	834	ALA	SER	engineered mutation	UNP Q9UKV8
B	387	ASP	SER	engineered mutation	UNP Q9UKV8
B	669	ALA	ASP	engineered mutation	UNP Q9UKV8
B	824	ALA	SER	engineered mutation	UNP Q9UKV8
B	828	ASP	SER	engineered mutation	UNP Q9UKV8
B	831	ASP	SER	engineered mutation	UNP Q9UKV8
B	834	ALA	SER	engineered mutation	UNP Q9UKV8

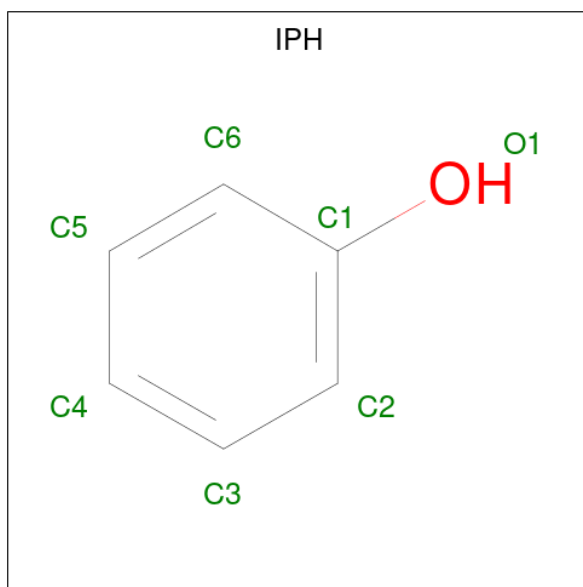
- Molecule 2 is a RNA chain called RNA (5'-R(P\*UP\*GP\*GP\*AP\*GP\*UP\*GP\*UP\*GP\*AP\*CP\*AP\*AP\*UP\*GP\*GP\*UP\*GP\*UP\*U)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
2	C	20	Total 433	C 192	N 77	O 144	P 20	0	0	0
2	D	14	Total 308	C 136	N 58	O 100	P 14	0	0	0

- Molecule 3 is a RNA chain called RNA (5'-R(P\*AP\*AP\*AP\*CP\*AP\*CP\*CP\*AP\*UP\*UP\*UP\*CP\*CP\*AP\*CP\*AP\*CP\*UP\*CP\*CP\*AP\*AP\*A)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	E	23	Total	C	N	O	P	0	0	0
			480	217	85	155	23			
3	F	17	Total	C	N	O	P	0	0	1
			299	131	50	102	16			

- Molecule 4 is PHENOL (three-letter code: IPH) (formula: C<sub>6</sub>H<sub>6</sub>O).

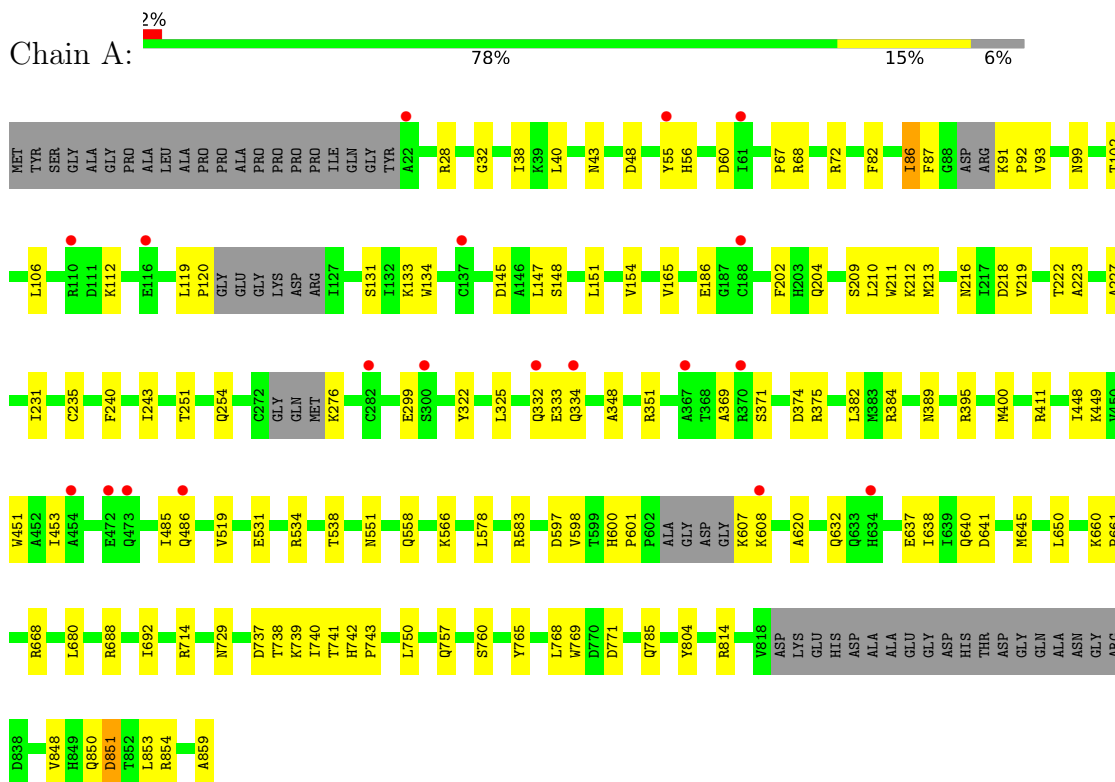


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			7	6	1		
4	A	1	Total	C	O	0	0
			7	6	1		
4	B	1	Total	C	O	0	0
			7	6	1		
4	B	1	Total	C	O	0	0
			7	6	1		

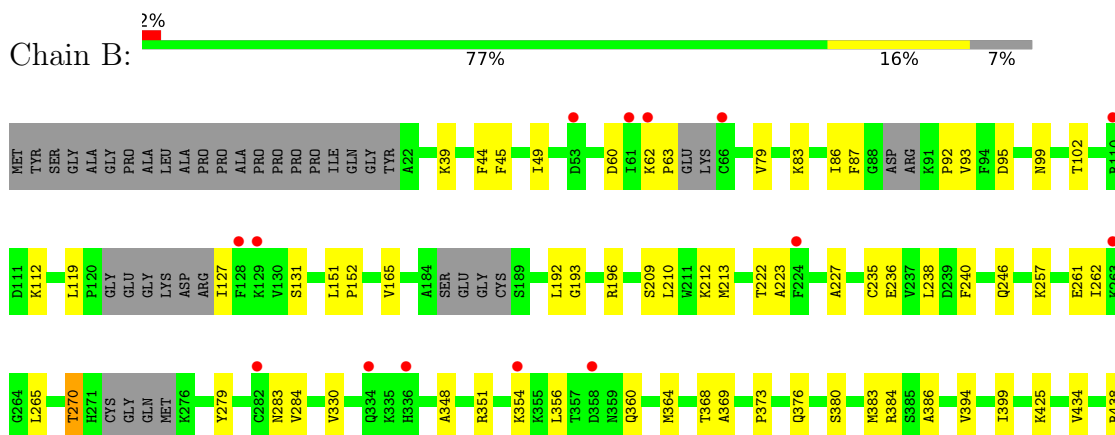
### 3 Residue-property plots [i](#)

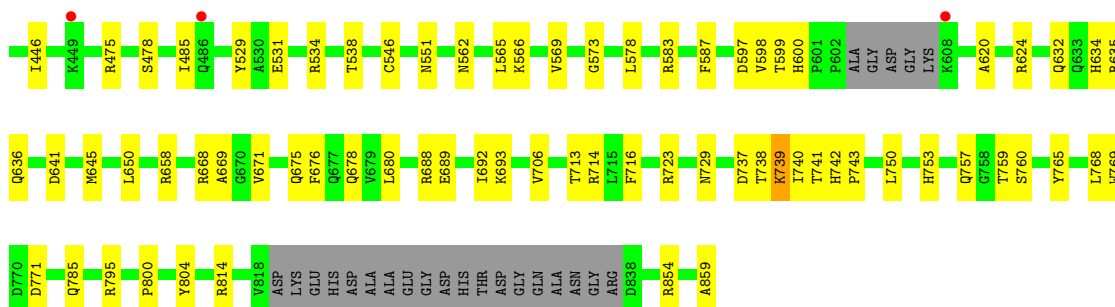
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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 ( $RSRZ > 2$ ). 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: Protein argonaute-2



#### • Molecule 1: Protein argonaute-2





- Molecule 2: RNA (5'-R(P\*UP\*GP\*GP\*AP\*GP\*UP\*GP\*UP\*GP\*AP\*CP\*AP\*AP\*UP\*GP\*GP\*UP\*GP\*UP\*U)-3')

Chain C: 43% 29% 24% 5%



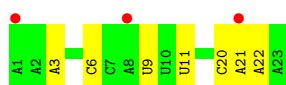
- Molecule 2: RNA (5'-R(P\*UP\*GP\*GP\*AP\*GP\*UP\*GP\*UP\*GP\*AP\*CP\*AP\*AP\*UP\*GP\*GP\*UP\*GP\*UP\*U)-3')

Chain D: 14% 19% 33% 14% 33%



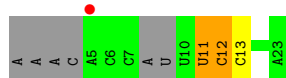
- Molecule 3: RNA (5'-R(P\*AP\*AP\*AP\*CP\*AP\*CP\*CP\*AP\*UP\*UP\*UP\*CP\*CP\*AP\*CP\*A\*P\*CP\*UP\*CP\*CP\*AP\*AP\*A)-3')

Chain E: 13% 70% 30%



- Molecule 3: RNA (5'-R(P\*AP\*AP\*AP\*CP\*AP\*CP\*CP\*AP\*UP\*UP\*UP\*CP\*CP\*AP\*CP\*A\*P\*CP\*UP\*CP\*CP\*AP\*AP\*A)-3')

Chain F: 4% 61% 9% 26%



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	107.61Å 138.29Å 152.61Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	38.29 – 3.40 38.29 – 3.40	Depositor EDS
% Data completeness (in resolution range)	99.3 (38.29-3.40) 99.3 (38.29-3.40)	Depositor EDS
$R_{merge}$	0.17	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.00 (at 3.40Å)	Xtrriage
Refinement program	PHENIX 1.9_1692	Depositor
R, $R_{free}$	0.220 , 0.264 0.221 , 0.264	Depositor DCC
$R_{free}$ test set	1589 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	69.3	Xtrriage
Anisotropy	0.233	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.28 , 34.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.90	EDS
Total number of atoms	14382	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	63.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 24.72 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 3.6319e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<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: IPH

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	0.20	0/6598	0.38	0/8930
1	B	0.21	0/6538	0.38	0/8849
2	C	0.50	1/484 (0.2%)	0.72	0/752
2	D	0.61	1/344 (0.3%)	0.74	0/532
3	E	0.25	0/535	0.85	1/828 (0.1%)
3	F	0.26	0/329	0.78	0/506
All	All	0.24	2/14828 (0.0%)	0.45	1/20397 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	1	U	OP3-P	-10.61	1.48	1.61
2	D	1	U	OP3-P	-10.59	1.48	1.61

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	E	11	U	N3-C2-O2	-5.35	118.46	122.20

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	6446	0	6513	81	1
1	B	6388	0	6455	86	1
2	C	433	0	214	9	0
2	D	308	0	152	11	0
3	E	480	0	250	3	0
3	F	299	0	153	3	0
4	A	14	0	12	1	0
4	B	14	0	12	2	0
All	All	14382	0	13761	172	1

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 172 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:B:531:GLU:OE2	1:B:534:ARG:NH1	1.98	0.96
1:B:566:LYS:NZ	1:B:859:ALA:OXT	2.02	0.92
1:A:351:ARG:NH2	2:C:11:C:OP1	2.01	0.92
1:B:583:ARG:NH1	1:B:620:ALA:O	2.19	0.75
1:B:196:ARG:HH11	1:B:356:LEU:HD23	1.54	0.73

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:299:GLU:OE2	1:B:438:ARG:NH2[4_455]	2.16	0.04

## 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	792/859 (92%)	747 (94%)	45 (6%)	0	100	100
1	B	780/859 (91%)	742 (95%)	37 (5%)	1 (0%)	51	82
All	All	1572/1718 (92%)	1489 (95%)	82 (5%)	1 (0%)	51	82

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	739	LYS

### 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	713/749 (95%)	707 (99%)	6 (1%)	81	91
1	B	706/749 (94%)	701 (99%)	5 (1%)	84	92
All	All	1419/1498 (95%)	1408 (99%)	11 (1%)	81	91

5 of 11 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	270	THR
1	B	364	MET
1	B	804	TYR
1	B	368	THR
1	A	804	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 16 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	634	HIS
1	B	588	GLN
1	A	729	ASN
1	B	247	GLN
1	A	553	GLN

### 5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
2	C	19/21 (90%)	6 (31%)	2 (10%)
2	D	12/21 (57%)	4 (33%)	0
3	E	22/23 (95%)	3 (13%)	0
3	F	12/23 (52%)	1 (8%)	1 (8%)
All	All	65/88 (73%)	14 (21%)	3 (4%)

5 of 14 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
2	C	11	C
2	C	14	U
2	C	15	G
2	C	17	U
2	C	18	G

All (3) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
2	C	13	A
2	C	14	U
3	F	11	U

## 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 monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

4 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
4	IPH	A	902	-	7,7,7	0.36	0	8,8,8	0.24	0
4	IPH	A	901	-	7,7,7	0.33	0	8,8,8	0.27	0
4	IPH	B	902	-	7,7,7	0.36	0	8,8,8	0.24	0
4	IPH	B	901	-	7,7,7	0.37	0	8,8,8	0.23	0

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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	IPH	A	902	-	-	-	0/1/1/1
4	IPH	A	901	-	-	-	0/1/1/1
4	IPH	B	902	-	-	-	0/1/1/1
4	IPH	B	901	-	-	-	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	901	IPH	1	0
4	B	902	IPH	1	0
4	B	901	IPH	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	804/859 (93%)	0.02	19 (2%) 59 57	16, 55, 103, 137	0
1	B	796/859 (92%)	0.08	17 (2%) 63 62	16, 58, 120, 163	0
2	C	20/21 (95%)	0.38	0 100 100	33, 113, 132, 133	0
2	D	14/21 (66%)	0.86	3 (21%) 0 1	29, 59, 176, 180	0
3	E	23/23 (100%)	0.67	3 (13%) 3 4	47, 99, 140, 148	0
3	F	17/23 (73%)	0.47	1 (5%) 22 23	47, 69, 162, 171	0
All	All	1674/1806 (92%)	0.07	43 (2%) 56 54	16, 57, 116, 180	0

The worst 5 of 43 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	66	CYS	4.9
2	D	12	A	4.2
1	B	334	GLN	4.1
1	B	282	CYS	3.8
1	B	53	ASP	3.7

### 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 monosaccharides 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. 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	B-factors(Å <sup>2</sup> )	Q<0.9
4	IPH	B	901	7/7	0.85	0.81	68,72,81,89	0
4	IPH	A	901	7/7	0.91	0.54	59,60,71,77	0
4	IPH	B	902	7/7	0.91	0.39	43,49,55,67	0
4	IPH	A	902	7/7	0.94	0.45	39,42,47,48	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.