



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 18, 2026 – 05:55 AM UTC

PDB ID : 5FA5 / pdb\_00005fa5  
Title : Crystal Structure of PRMT5:MEP50 in complex with MTA and H4 peptide  
Authors : Sprague, E.R.; McNamara, J.T.  
Deposited on : 2015-12-10  
Resolution : 2.34 Å(reported)

This is a Full wwPDB X-ray Structure Validation 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 : 4-5-2 with Phenix2.0  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtriage (Phenix) : 2.0  
EDS : 3.0  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
CCP4 : 9.0.010 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.49

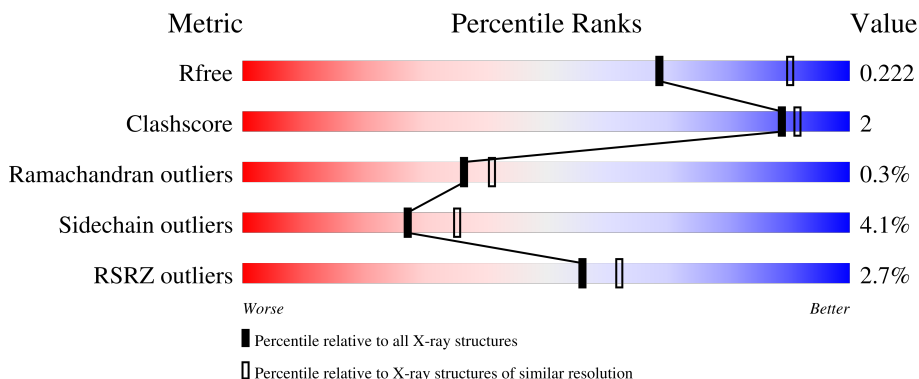
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.34 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))
$R_{free}$	180053	3031 (2.36-2.32)
Clashscore	190562	3127 (2.36-2.32)
Ramachandran outliers	187476	3095 (2.36-2.32)
Sidechain outliers	187428	3095 (2.36-2.32)
RSRZ outliers	180081	3033 (2.36-2.32)

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	650	 2% 87% 8% . .
2	B	367	 3% 72% 10% . 18%
3	C	20	 5% 5% 95%

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 7541 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 arginine N-methyltransferase 5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	625	5061	3237	869	931	24	0	0	0

There are 13 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-12	MET	-	initiating methionine	UNP O14744
A	-11	ASP	-	expression tag	UNP O14744
A	-10	TYR	-	expression tag	UNP O14744
A	-9	LYS	-	expression tag	UNP O14744
A	-8	ASP	-	expression tag	UNP O14744
A	-7	ASP	-	expression tag	UNP O14744
A	-6	ASP	-	expression tag	UNP O14744
A	-5	ASP	-	expression tag	UNP O14744
A	-4	LYS	-	expression tag	UNP O14744
A	-3	GLY	-	expression tag	UNP O14744
A	-2	ARG	-	expression tag	UNP O14744
A	-1	ALA	-	expression tag	UNP O14744
A	0	THR	-	expression tag	UNP O14744

- Molecule 2 is a protein called Methylosome protein 50.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	301	2281	1433	391	445	12	0	0	0

There are 26 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-24	MET	-	initiating methionine	UNP Q9BQA1
B	-23	SER	-	expression tag	UNP Q9BQA1
B	-22	TYR	-	expression tag	UNP Q9BQA1

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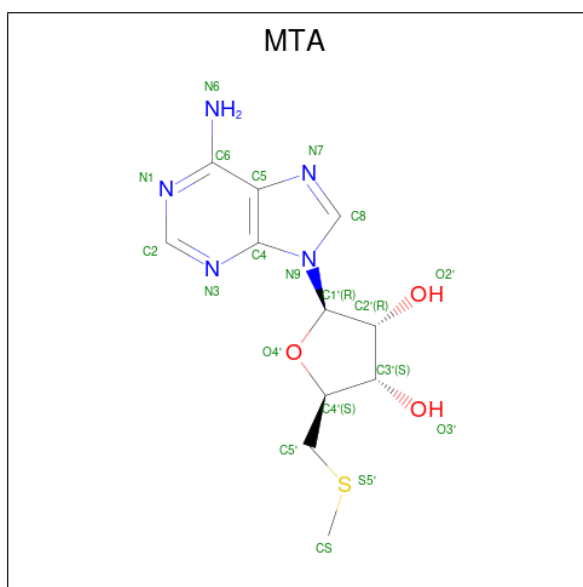
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Chain	Residue	Modelled	Actual	Comment	Reference
B	-21	TYR	-	expression tag	UNP Q9BQA1
B	-20	HIS	-	expression tag	UNP Q9BQA1
B	-19	HIS	-	expression tag	UNP Q9BQA1
B	-18	HIS	-	expression tag	UNP Q9BQA1
B	-17	HIS	-	expression tag	UNP Q9BQA1
B	-16	HIS	-	expression tag	UNP Q9BQA1
B	-15	HIS	-	expression tag	UNP Q9BQA1
B	-14	ASP	-	expression tag	UNP Q9BQA1
B	-13	TYR	-	expression tag	UNP Q9BQA1
B	-12	ASP	-	expression tag	UNP Q9BQA1
B	-11	LEU	-	expression tag	UNP Q9BQA1
B	-10	PRO	-	expression tag	UNP Q9BQA1
B	-9	THR	-	expression tag	UNP Q9BQA1
B	-8	THR	-	expression tag	UNP Q9BQA1
B	-7	GLU	-	expression tag	UNP Q9BQA1
B	-6	ASN	-	expression tag	UNP Q9BQA1
B	-5	LEU	-	expression tag	UNP Q9BQA1
B	-4	TYR	-	expression tag	UNP Q9BQA1
B	-3	PHE	-	expression tag	UNP Q9BQA1
B	-2	GLN	-	expression tag	UNP Q9BQA1
B	-1	GLY	-	expression tag	UNP Q9BQA1
B	0	SER	-	expression tag	UNP Q9BQA1
B	1	LEU	-	expression tag	UNP Q9BQA1

- Molecule 3 is a protein called Histone H4.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	C	1	Total	C	N	O	0	0	0
			11	6	4	1			

- Molecule 4 is 5'-DEOXY-5'-METHYLTHIOADENOSINE (CCD ID: MTA) (formula:  $C_{11}H_{15}N_5O_3S$ ).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
4	A	1	20	11	5	3	1	0	0

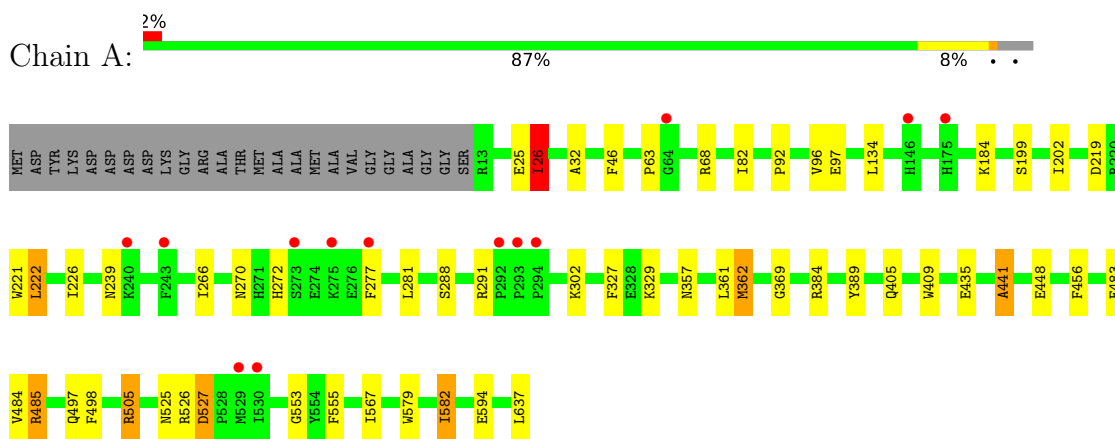
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	145	Total	O	0	0
			145	145		
5	B	23	Total	O	0	0
			23	23		

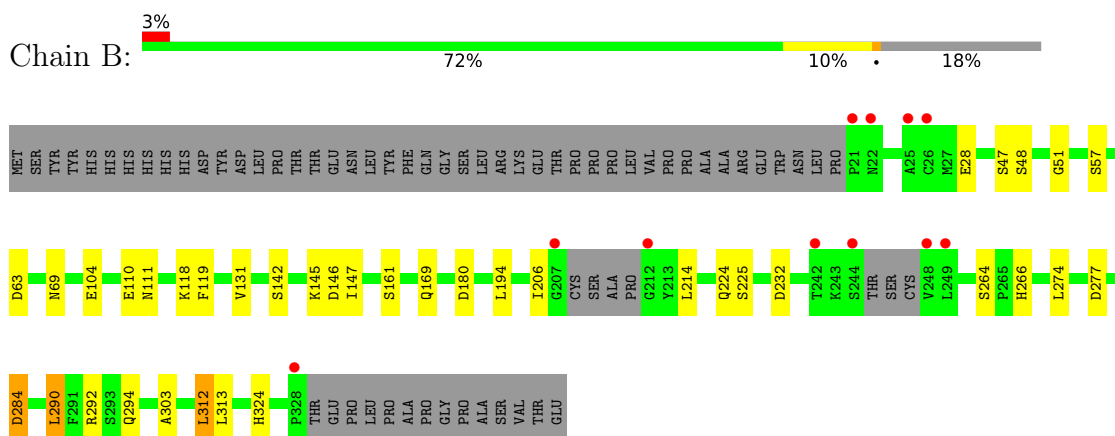
### 3 Residue-property plots [i](#)

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.

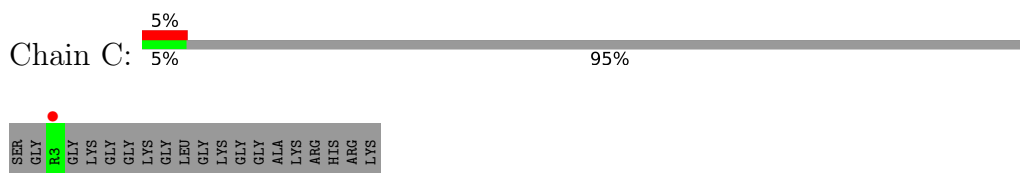
- Molecule 1: Protein arginine N-methyltransferase 5



- Molecule 2: Methylosome protein 50



- Molecule 3: Histone H4



## 4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	102.05Å 137.85Å 178.43Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	89.22 – 2.34 89.22 – 2.34	Depositor EDS
% Data completeness (in resolution range)	99.8 (89.22-2.34) 99.9 (89.22-2.34)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.31 (at 2.34Å)	Xtriage
Refinement program	BUSTER-TNT BUSTER 2.11.2	Depositor
R, $R_{free}$	0.177 , 0.221 0.180 , 0.222	Depositor DCC
$R_{free}$ test set	2625 reflections (4.93%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	47.2	Xtriage
Anisotropy	0.737	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 52.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	7541	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	64.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.39% 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:  
MTA

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	0.88	1/5203 (0.0%)	1.26	19/7078 (0.3%)
2	B	0.79	0/2334	1.29	13/3184 (0.4%)
3	C	1.40	0/10	1.31	0/11
All	All	0.86	1/7547 (0.0%)	1.27	32/10273 (0.3%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	362	MET	SD-CE	-8.68	1.57	1.79

All (32) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	26	ILE	N-CA-CB	7.55	118.55	110.62
2	B	214	LEU	N-CA-C	6.84	117.47	109.60
2	B	224	GLN	CA-C-N	6.82	130.33	120.38
2	B	224	GLN	C-N-CA	6.82	130.33	120.38
2	B	232	ASP	CA-CB-CG	6.67	119.27	112.60
2	B	277	ASP	CA-CB-CG	6.17	118.77	112.60
1	A	409	TRP	N-CA-C	6.08	117.70	111.14
1	A	239	ASN	CA-CB-CG	6.01	118.61	112.60
1	A	96	VAL	CA-C-N	5.73	128.28	120.54
1	A	96	VAL	C-N-CA	5.73	128.28	120.54
2	B	69	ASN	CA-C-N	5.71	127.92	120.28
2	B	69	ASN	C-N-CA	5.71	127.92	120.28
1	A	327	PHE	CA-CB-CG	5.53	119.33	113.80
1	A	527	ASP	N-CA-C	5.46	116.28	109.57
1	A	525	ASN	CA-C-N	5.45	127.52	120.44
1	A	525	ASN	C-N-CA	5.45	127.52	120.44
2	B	146	ASP	CA-CB-CG	5.43	118.03	112.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	82	ILE	N-CA-C	5.41	115.69	108.11
1	A	26	ILE	N-CA-C	5.30	115.75	110.23
1	A	357	ASN	N-CA-C	5.29	117.33	108.23
1	A	46	PHE	N-CA-C	-5.19	101.30	109.50
2	B	119	PHE	CA-CB-CG	5.15	118.95	113.80
2	B	63	ASP	CA-CB-CG	5.12	117.72	112.60
2	B	284	ASP	CA-CB-CG	5.11	117.71	112.60
1	A	272	HIS	CA-C-N	5.09	131.27	121.54
1	A	272	HIS	C-N-CA	5.09	131.27	121.54
1	A	369	GLY	N-CA-C	5.06	122.66	112.34
1	A	184	LYS	N-CA-C	5.05	117.44	111.33
2	B	142	SER	CA-C-N	5.04	125.49	121.61
2	B	142	SER	C-N-CA	5.04	125.49	121.61
1	A	32	ALA	CA-C-N	5.04	126.91	120.56
1	A	32	ALA	C-N-CA	5.04	126.91	120.56

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	5061	0	4952	20	0
2	B	2281	0	2200	8	0
3	C	11	0	12	0	0
4	A	20	0	15	1	0
5	A	145	0	0	0	0
5	B	23	0	0	0	0
All	All	7541	0	7179	27	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 2.

All (27) 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:362:MET:HE1	1:A:456:PHE:CD1	2.10	0.86
1:A:26:ILE:HD11	1:A:68:ARG:HD3	1.72	0.72
2:B:194:LEU:HB2	2:B:206:ILE:HD11	1.74	0.70
1:A:441:ALA:HB2	1:A:555:PHE:HB2	1.80	0.63
1:A:553:GLY:HA3	1:A:582:ILE:HG22	1.84	0.59
1:A:362:MET:HE1	1:A:456:PHE:CE1	2.42	0.53
1:A:505:ARG:HD3	1:A:505:ARG:C	2.35	0.52
2:B:264:SER:HB2	2:B:266:HIS:HD2	1.75	0.51
1:A:270:ASN:HB2	1:A:277:PHE:HD2	1.75	0.50
1:A:567:ILE:HG21	1:A:579:TRP:HB2	1.93	0.50
1:A:92:PRO:HG2	1:A:134:LEU:HD12	1.95	0.49
2:B:284:ASP:HB3	2:B:290:LEU:HD11	1.96	0.48
1:A:435:GLU:HG3	4:A:701:MTA:HCS3	1.96	0.47
1:A:221:TRP:HB3	1:A:226:ILE:HD11	1.98	0.46
1:A:219:ASP:O	1:A:222:LEU:HB2	2.16	0.46
2:B:303:ALA:HB1	2:B:313:LEU:HD11	1.99	0.44
1:A:68:ARG:HB3	2:B:51:GLY:O	2.18	0.44
1:A:362:MET:HG2	1:A:389:TYR:HB2	2.00	0.44
2:B:145:LYS:HA	2:B:169:GLN:HG2	1.99	0.43
1:A:448:GLU:HG2	1:A:637:LEU:HD21	2.01	0.43
1:A:288:SER:O	1:A:291:ARG:HG2	2.19	0.42
2:B:312:LEU:HD21	2:B:324:HIS:HB3	2.02	0.42
1:A:435:GLU:HG3	1:A:435:GLU:O	2.20	0.42
1:A:485:ARG:HG3	1:A:498:PHE:HZ	1.85	0.42
1:A:199:SER:HB3	1:A:202:ILE:HD12	2.02	0.41
1:A:484:VAL:O	1:A:497:GLN:HG3	2.20	0.41
2:B:28:GLU:OE1	2:B:57:SER:OG	2.38	0.40

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	623/650 (96%)	606 (97%)	15 (2%)	2 (0%)	36	41
2	B	295/367 (80%)	288 (98%)	6 (2%)	1 (0%)	36	41
All	All	918/1017 (90%)	894 (97%)	21 (2%)	3 (0%)	36	41

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	147	ILE
1	A	441	ALA
1	A	63	PRO

### 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	558/573 (97%)	540 (97%)	18 (3%)	34	44
2	B	255/314 (81%)	240 (94%)	15 (6%)	18	21
3	C	1/11 (9%)	1 (100%)	0	100	100
All	All	814/898 (91%)	781 (96%)	33 (4%)	27	35

All (33) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	25	GLU
1	A	26	ILE
1	A	97	GLU
1	A	222	LEU
1	A	266	ILE
1	A	281	LEU
1	A	302	LYS
1	A	329	LYS
1	A	361	LEU
1	A	384	ARG
1	A	405	GLN
1	A	483	GLU

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Mol	Chain	Res	Type
1	A	485	ARG
1	A	505	ARG
1	A	526	ARG
1	A	527	ASP
1	A	582	ILE
1	A	594	GLU
2	B	47	SER
2	B	48	SER
2	B	104	GLU
2	B	110	GLU
2	B	111	ASN
2	B	118	LYS
2	B	131	VAL
2	B	161	SER
2	B	180	ASP
2	B	225	SER
2	B	274	LEU
2	B	290	LEU
2	B	292	ARG
2	B	294	GLN
2	B	312	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	66	GLN
1	A	339	GLN
2	B	69	ASN
2	B	178	HIS
2	B	224	GLN
2	B	234	ASN
2	B	254	HIS
2	B	309	ASN

### 5.3.3 RNA

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 oligosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

1 ligand is 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	MTA	A	701	-	22,22,22	0.79	0	32,32,32	0.54	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. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	MTA	A	701	-	-	0/7/23/23	0/3/3/3

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.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	701	MTA	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

### 6.1 Protein, DNA and RNA chains

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	625/650 (96%)	-0.07	13 (2%) 63 68	33, 55, 92, 127	0
2	B	301/367 (82%)	0.34	11 (3%) 45 51	52, 75, 108, 145	0
3	C	1/20 (5%)	5.04	1 (100%) 0 0	83, 83, 83, 83	0
All	All	927/1037 (89%)	0.07	25 (2%) 56 62	33, 62, 102, 145	0

All (25) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	248	VAL	5.2
3	C	3	ARG	5.0
2	B	207	GLY	4.4
2	B	244	SER	4.1
1	A	530	ILE	3.8
2	B	21	PRO	3.8
1	A	529	MET	3.7
1	A	146	HIS	3.2
2	B	328	PRO	3.1
1	A	64	GLY	3.0
1	A	277	PHE	2.8
2	B	25	ALA	2.8
2	B	242	THR	2.7
1	A	275	LYS	2.7
2	B	249	LEU	2.6
1	A	240	LYS	2.6
1	A	175	HIS	2.4
2	B	212	GLY	2.4
1	A	293	PRO	2.3
1	A	294	PRO	2.3
1	A	243	PHE	2.2
1	A	292	PRO	2.2
1	A	273	SER	2.2

*Continued on next page...*

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Mol	Chain	Res	Type	RSRZ
2	B	26	CYS	2.1
2	B	22	ASN	2.0

## 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 oligosaccharides 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	MTA	A	701	20/20	0.97	0.06	36,42,49,52	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.