



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 8, 2026 – 11:29 PM UTC

PDB ID : 2FMT / pdb\_00002fmt  
Title : METHIONYL-TRNAFMET FORMYLTRANSFERASE COMPLEXED  
WITH FORMYL-METHIONYL-TRNAFMET  
Authors : Schmitt, E.; Mechulam, Y.; Blanquet, S.  
Deposited on : 1998-07-29  
Resolution : 2.80 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 : 4-5-2 with Phenix2.0  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.49

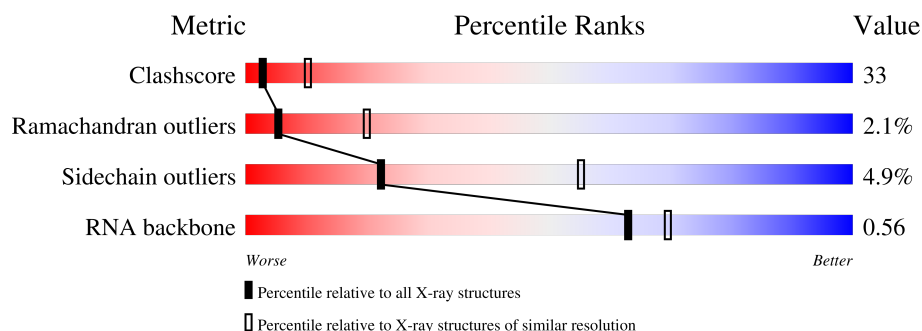
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.80 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))
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (2.80-2.80)
RNA backbone	3983	1114 (3.00-2.60)

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  $\leq 5\%$

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	C	77	<div> <div style="width: 21%; background-color: green;"></div> <div style="width: 58%; background-color: yellow;"></div> <div style="width: 17%; background-color: orange;"></div> <div style="width: 4%; background-color: red;"></div> </div> <div>21% 58% 17% .</div>
1	D	77	<div> <div style="width: 22%; background-color: green;"></div> <div style="width: 57%; background-color: yellow;"></div> <div style="width: 16%; background-color: orange;"></div> <div style="width: 5%; background-color: red;"></div> </div> <div>22% 57% 16% 5%</div>
2	A	314	<div> <div style="width: 52%; background-color: green;"></div> <div style="width: 42%; background-color: yellow;"></div> <div style="width: 6%; background-color: orange;"></div> </div> <div>52% 42% 6%</div>
2	B	314	<div> <div style="width: 47%; background-color: green;"></div> <div style="width: 46%; background-color: yellow;"></div> <div style="width: 6%; background-color: orange;"></div> </div> <div>47% 46% 6%</div>

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
1	OMC	C	32	-	-	X	-
1	OMC	D	32	-	-	X	-

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 8179 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 RNA chain called FORMYL-METHIONYL-TRNAFMET2.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	C	77	Total	C	N	O	P	S	0	0	0
			1645	734	297	536	77	1			
1	D	77	Total	C	N	O	P	S	0	0	0
			1645	734	297	536	77	1			

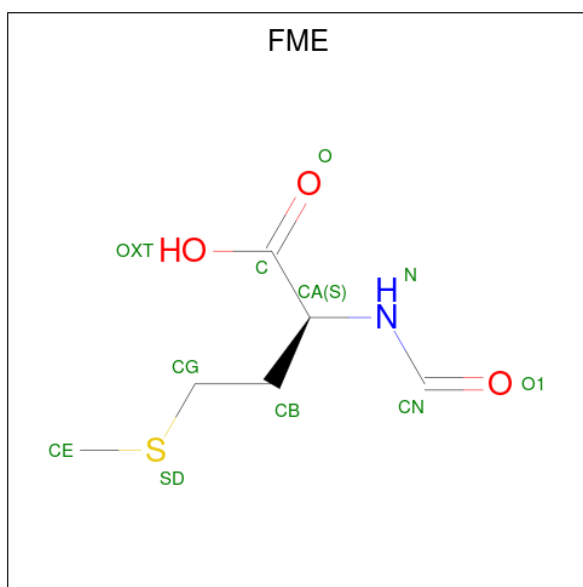
- Molecule 2 is a protein called METHIONYL-TRNA FMET FORMYLTRANSFERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	A	314	Total	C	N	O	S	0	0	0
			2392	1517	414	450	11			
2	B	314	Total	C	N	O	S	0	0	0
			2392	1517	414	450	11			

- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	C	1	Total	Mg	0	0
			1	1		
3	D	1	Total	Mg	0	0
			1	1		

- Molecule 4 is N-FORMYLMETHIONINE (CCD ID: FME) (formula: C<sub>6</sub>H<sub>11</sub>NO<sub>3</sub>S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	C	1	Total	C	N	O	S	0	0
			10	6	1	2	1		
4	D	1	Total	C	N	O	S	0	0
			10	6	1	2	1		

- Molecule 5 is water.

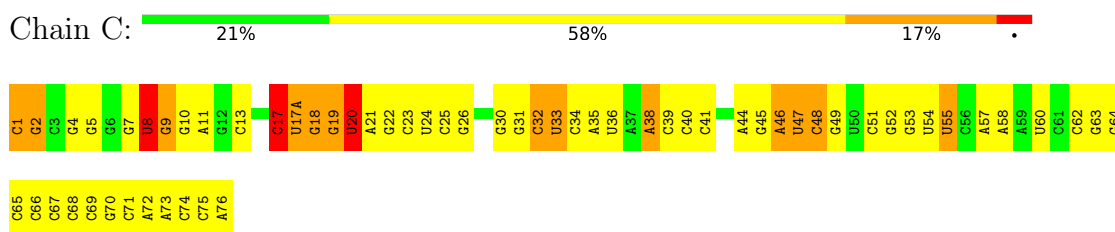
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	C	17	Total	O	0	0
			17	17		
5	D	13	Total	O	0	0
			13	13		
5	A	35	Total	O	0	0
			35	35		
5	B	18	Total	O	0	0
			18	18		

### 3 Residue-property plots

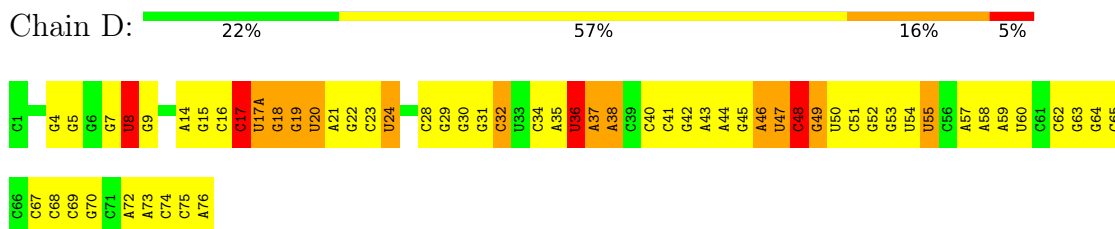
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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.

Note EDS was not executed.

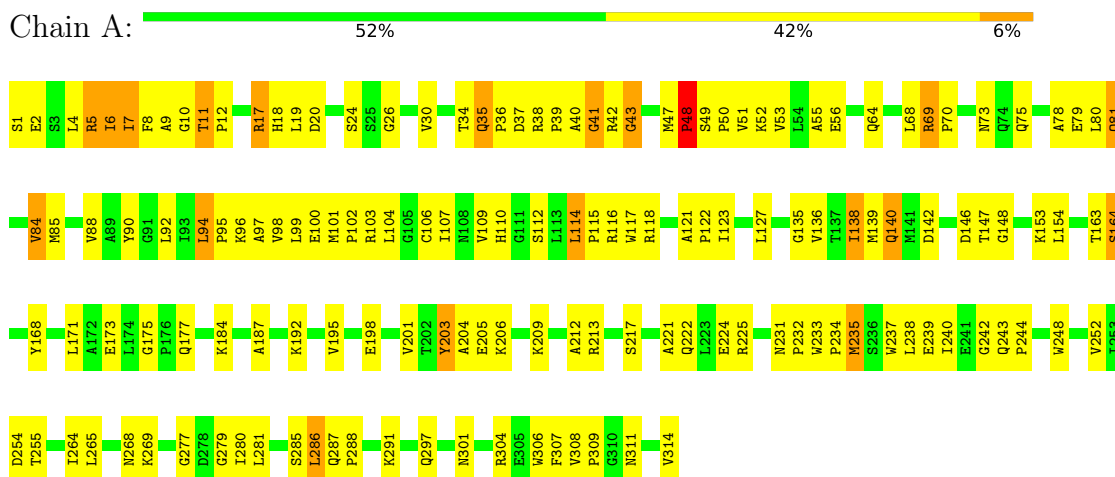
#### • Molecule 1: FORMYL-METHIONYL-TRNAFMET2



#### • Molecule 1: FORMYL-METHIONYL-TRNAFMET2



#### • Molecule 2: METHIONYL-TRNA FMET FORMYLTRANSFERASE



#### • Molecule 2: METHIONYL-TRNA FMET FORMYLTRANSFERASE



M235	G144	S1	Q75
S236	L145	E2	A78
W237	D146	S3	E79
L238	T147	L4	L80
E239	G148	R5	Q81
I240		I6	A82
E241	I158	I7	D83
G242		F8	V84
Q243	T163	A9	M85
P244	S164	G10	V86
		T11	V87
V252	Y168	P12	
I253			Y90
A256	L171	R17	G91
	A172	H13	L92
A260	E173	L23	I93
P261	L174	L24	L94
G262	G175	S24	P95
T263	P176		K96
I264		N28	A97
L265	L179	V29	V98
		V30	L99
I272	L186	G31	E100
Q273	A187		M101
V274		T34	P102
A275	A191	Q35	R103
T276		P36	L104
G277	V195	D37	G105
D278	Q196	R38	C106
G279	D197	P39	I107
	E198	A40	N108
I280		G41	V109
L281	V201	R42	H110
N282	T202	G43	G111
L283	Y203		S112
L284	A204	M47	L113
S285	E205	P48	L114
L286	K206	S49	P115
Q287	L207	P50	R116
P288	S208	K52	W117
A289	K209	V53	R118
		L54	G119
S302	A212	A55	A120
R303	R213	E56	A121
R304	I214		P122
E305	D215		I123
W306	W216		Q124
F307	S217		R125
V308	L218		S126
	S219		L127
			W128
	Q222		G135
	L223		
	E224		M139
	R225		Q140
			M141
	N231		D142
	P232		N73
	W233		V143
	P234		

## 4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	201.71Å 68.06Å 86.35Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.00 – 2.80	Depositor
% Data completeness (in resolution range)	87.2 (19.00-2.80)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.05	Depositor
Refinement program	CNS 0.3C	Depositor
R, $R_{free}$	0.247 , 0.292	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	8179	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	62.0	wwPDB-VP



## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: 5MU, FME, MG, PSU, H2U, OMC, 4SU

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	C	0.47	0/1725	0.67	2/2687 (0.1%)
1	D	0.47	1/1725 (0.1%)	0.69	4/2687 (0.1%)
2	A	0.65	0/2439	1.15	19/3317 (0.6%)
2	B	0.61	0/2439	1.14	19/3317 (0.6%)
All	All	0.57	1/8328 (0.0%)	0.96	44/12008 (0.4%)

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	D	8	4SU	O3'-P	5.24	1.61	1.56

The worst 5 of 44 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	36	U	C2'-C3'-O3'	-8.24	101.33	113.70
2	A	94	LEU	CA-C-N	7.24	127.16	119.85
2	A	94	LEU	C-N-CA	7.24	127.16	119.85
2	B	201	VAL	N-CA-C	7.18	118.83	107.98
2	A	287	GLN	CA-C-N	7.09	127.35	119.90

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	D	24	U	Sidechain

## 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	C	1645	0	839	88	0
1	D	1645	0	839	76	0
2	A	2392	0	2442	146	0
2	B	2392	0	2442	190	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
4	C	10	0	10	1	0
4	D	10	0	10	1	0
5	A	35	0	0	0	0
5	B	18	0	0	0	0
5	C	17	0	0	0	0
5	D	13	0	0	0	0
All	All	8179	0	6582	479	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 33.

The worst 5 of 479 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:C:32:OMC:CM2	1:C:32:OMC:O2'	1.68	1.42
1:C:32:OMC:O2'	1:C:32:OMC:C2'	1.68	1.41
1:D:32:OMC:O2'	1:D:32:OMC:CM2	1.71	1.37
1:C:1:C:H3'	1:C:2:G:C5'	1.78	1.13
1:C:1:C:C3'	1:C:2:G:H5'	1.80	1.10

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 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	
2	A	312/314 (99%)	262 (84%)	45 (14%)	5 (2%)	7	27
2	B	312/314 (99%)	264 (85%)	40 (13%)	8 (3%)	4	15
All	All	624/628 (99%)	526 (84%)	85 (14%)	13 (2%)	5	20

5 of 13 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	256	ALA
2	B	175	GLY
2	A	11	THR
2	B	42	ARG
2	A	235	MET

### 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	
2	A	257/257 (100%)	242 (94%)	15 (6%)	18	49
2	B	257/257 (100%)	247 (96%)	10 (4%)	28	64
All	All	514/514 (100%)	489 (95%)	25 (5%)	22	55

5 of 25 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	A	286	LEU

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Mol	Chain	Res	Type
2	B	79	GLU
2	B	238	LEU
2	B	35	GLN
2	B	103	ARG

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

Mol	Chain	Res	Type
2	B	222	GLN
2	B	196	GLN
2	A	301	ASN
2	B	185	GLN
2	A	297	GLN

### 5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	C	76/77 (98%)	14 (18%)	3 (3%)
1	D	76/77 (98%)	14 (18%)	4 (5%)
All	All	152/154 (98%)	28 (18%)	7 (4%)

5 of 28 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	C	2	G
1	C	8	4SU
1	C	9	G
1	C	17	C
1	C	17(A)	U

5 of 7 RNA pucker outliers are listed below:

Mol	Chain	Res	Type
1	D	17	C
1	D	17(A)	U
1	D	46	A
1	D	36	U
1	C	46	A

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

10 non-standard protein/DNA/RNA residues 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
1	5MU	D	54	1	19,22,23	0.26	0	27,32,35	0.33	0
1	5MU	C	54	1	19,22,23	0.22	0	27,32,35	0.33	0
1	H2U	C	20	1	18,21,22	0.81	1 (5%)	19,30,33	0.75	0
1	OMC	D	32	1	19,22,23	2.29	2 (10%)	25,31,34	0.71	0
1	4SU	D	8	1	18,21,22	5.76	1 (5%)	25,30,33	0.30	0
1	PSU	C	55	1	18,21,22	1.75	1 (5%)	21,30,33	0.81	1 (4%)
1	OMC	C	32	1	19,22,23	3.03	2 (10%)	25,31,34	0.82	1 (4%)
1	H2U	D	20	1	18,21,22	1.12	1 (5%)	19,30,33	0.70	0
1	4SU	C	8	1	18,21,22	5.41	1 (5%)	25,30,33	0.43	0
1	PSU	D	55	1	18,21,22	1.79	1 (5%)	21,30,33	0.78	1 (4%)

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
1	5MU	D	54	1	-	0/7/25/26	0/2/2/2
1	5MU	C	54	1	-	0/7/25/26	0/2/2/2
1	H2U	C	20	1	-	3/7/38/39	0/2/2/2
1	OMC	D	32	1	-	1/9/27/28	0/2/2/2
1	4SU	D	8	1	-	0/7/25/26	0/2/2/2
1	PSU	C	55	1	-	1/7/25/26	0/2/2/2
1	OMC	C	32	1	-	1/9/27/28	0/2/2/2
1	H2U	D	20	1	-	5/7/38/39	0/2/2/2
1	4SU	C	8	1	-	0/7/25/26	0/2/2/2
1	PSU	D	55	1	-	1/7/25/26	0/2/2/2

The worst 5 of 10 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	8	4SU	C4-S4	-24.40	1.25	1.68
1	C	8	4SU	C4-S4	-22.87	1.27	1.68
1	C	32	OMC	O2'-C2'	10.59	1.68	1.42
1	D	32	OMC	O2'-CM2	8.39	1.71	1.42
1	C	32	OMC	O2'-CM2	7.62	1.68	1.42

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	55	PSU	C5-C6-N1	2.38	125.45	122.14
1	C	55	PSU	C5-C6-N1	2.36	125.42	122.14
1	C	32	OMC	O3'-C3'-C4'	-2.21	104.73	111.08

There are no chirality outliers.

5 of 12 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	C	20	H2U	C3'-C4'-C5'-O5'
1	C	32	OMC	C1'-C2'-O2'-CM2
1	D	20	H2U	O4'-C1'-N1-C6
1	D	20	H2U	C2'-C1'-N1-C2
1	D	20	H2U	C2'-C1'-N1-C6

There are no ring outliers.

9 monomers are involved in 38 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	D	54	5MU	3	0
1	C	54	5MU	2	0
1	C	20	H2U	4	0
1	D	32	OMC	9	0
1	D	8	4SU	2	0
1	C	55	PSU	3	0
1	C	32	OMC	11	0
1	C	8	4SU	3	0
1	D	55	PSU	5	0

## 5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry

Of 4 ligands modelled in this entry, 2 are monoatomic - leaving 2 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	FME	C	585	1	8,9,10	1.45	2 (25%)	8,9,11	1.61	2 (25%)
4	FME	D	586	1	8,9,10	0.95	0	8,9,11	2.02	3 (37%)

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	FME	C	585	1	-	5/7/9/11	-
4	FME	D	586	1	-	2/7/9/11	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	585	FME	CN-N	2.91	1.42	1.33
4	C	585	FME	O-C	2.09	1.27	1.20

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	586	FME	C-CA-N	3.44	116.14	109.50
4	D	586	FME	O-C-CA	-3.08	116.84	124.77
4	D	586	FME	CB-CA-N	-2.83	105.36	110.52
4	C	585	FME	O-C-CA	-2.70	117.82	124.77
4	C	585	FME	C-CA-N	2.42	114.16	109.50

There are no chirality outliers.

5 of 7 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	C	585	FME	O1-CN-N-CA
4	C	585	FME	N-CA-CB-CG
4	C	585	FME	C-CA-CB-CG
4	C	585	FME	O-C-CA-CB
4	D	586	FME	O1-CN-N-CA

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	C	585	FME	1	0
4	D	586	FME	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

EDS was not executed - this section is therefore empty.

### 6.2 Non-standard residues in protein, DNA, RNA chains

EDS was not executed - this section is therefore empty.

### 6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

### 6.4 Ligands

EDS was not executed - this section is therefore empty.

### 6.5 Other polymers

EDS was not executed - this section is therefore empty.