



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 21, 2024 – 03:50 AM EST

PDB ID : 4ORH  
Title : Crystal structure of RNF8 bound to the UBC13/MMS2 heterodimer  
Authors : Campbell, S.J.; Edwards, R.A.; Glover, J.N.M.  
Deposited on : 2014-02-11  
Resolution : 4.80 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)

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<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  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
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

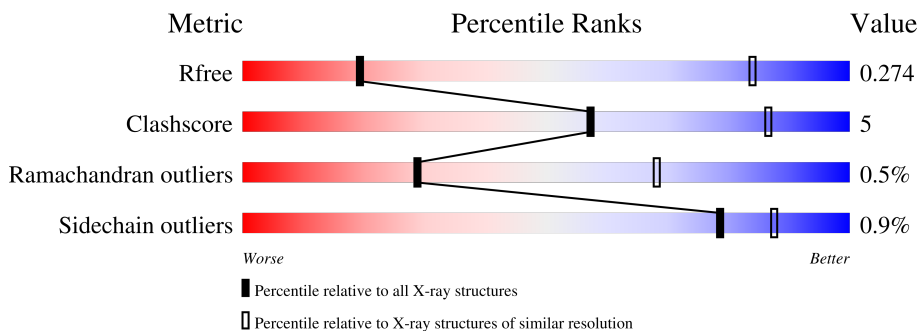
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 4.80 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))
$R_{free}$	130704	1096 (5.80-3.80)
Clashscore	141614	1170 (5.80-3.80)
Ramachandran outliers	138981	1105 (5.80-3.80)
Sidechain outliers	138945	1085 (5.80-3.80)

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  $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	153	
1	E	153	
1	I	153	
2	B	160	
2	F	160	
2	J	160	
3	C	149	

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Mol	Chain	Length	Quality of chain
3	G	149	 85% 7% 7%
3	H	149	 89% 7% 5%
3	K	149	 84% 9% 7%
3	L	149	 90% 5% 5%

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 11524 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 Ubiquitin-conjugating enzyme E2 variant 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	139	1121	702	196	215	8	0	3	0
1	E	138	1117	700	195	214	8	0	3	0
1	I	138	1117	700	195	214	8	0	3	0

There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-7	GLY	-	expression tag	UNP Q15819
A	-6	PRO	-	expression tag	UNP Q15819
A	-5	LEU	-	expression tag	UNP Q15819
A	-4	GLY	-	expression tag	UNP Q15819
A	-3	SER	-	expression tag	UNP Q15819
A	-2	PRO	-	expression tag	UNP Q15819
A	-1	GLU	-	expression tag	UNP Q15819
A	0	PHE	-	expression tag	UNP Q15819
E	-7	GLY	-	expression tag	UNP Q15819
E	-6	PRO	-	expression tag	UNP Q15819
E	-5	LEU	-	expression tag	UNP Q15819
E	-4	GLY	-	expression tag	UNP Q15819
E	-3	SER	-	expression tag	UNP Q15819
E	-2	PRO	-	expression tag	UNP Q15819
E	-1	GLU	-	expression tag	UNP Q15819
E	0	PHE	-	expression tag	UNP Q15819
I	-7	GLY	-	expression tag	UNP Q15819
I	-6	PRO	-	expression tag	UNP Q15819
I	-5	LEU	-	expression tag	UNP Q15819
I	-4	GLY	-	expression tag	UNP Q15819
I	-3	SER	-	expression tag	UNP Q15819
I	-2	PRO	-	expression tag	UNP Q15819
I	-1	GLU	-	expression tag	UNP Q15819

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Chain	Residue	Modelled	Actual	Comment	Reference
I	0	PHE	-	expression tag	UNP Q15819

- Molecule 2 is a protein called Ubiquitin-conjugating enzyme E2 N.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	148	1192	767	205	215	5	0	2	0
2	F	148	1192	767	205	215	5	0	2	0
2	J	148	1192	767	205	215	5	0	2	0

There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-7	GLY	-	expression tag	UNP P61088
B	-6	PRO	-	expression tag	UNP P61088
B	-5	LEU	-	expression tag	UNP P61088
B	-4	GLY	-	expression tag	UNP P61088
B	-3	SER	-	expression tag	UNP P61088
B	-2	PRO	-	expression tag	UNP P61088
B	-1	GLU	-	expression tag	UNP P61088
B	0	PHE	-	expression tag	UNP P61088
F	-7	GLY	-	expression tag	UNP P61088
F	-6	PRO	-	expression tag	UNP P61088
F	-5	LEU	-	expression tag	UNP P61088
F	-4	GLY	-	expression tag	UNP P61088
F	-3	SER	-	expression tag	UNP P61088
F	-2	PRO	-	expression tag	UNP P61088
F	-1	GLU	-	expression tag	UNP P61088
F	0	PHE	-	expression tag	UNP P61088
J	-7	GLY	-	expression tag	UNP P61088
J	-6	PRO	-	expression tag	UNP P61088
J	-5	LEU	-	expression tag	UNP P61088
J	-4	GLY	-	expression tag	UNP P61088
J	-3	SER	-	expression tag	UNP P61088
J	-2	PRO	-	expression tag	UNP P61088
J	-1	GLU	-	expression tag	UNP P61088
J	0	PHE	-	expression tag	UNP P61088

- Molecule 3 is a protein called E3 ubiquitin-protein ligase RNF8.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	C	92	723	451	128	134	10	0	0	0
3	G	139	958	592	175	181	10	0	0	0
3	H	142	972	600	178	184	10	0	0	0
3	K	139	958	592	175	181	10	0	0	0
3	L	142	972	600	178	184	10	0	0	0

There are 40 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	337	GLY	-	expression tag	UNP O76064
C	338	PRO	-	expression tag	UNP O76064
C	339	LEU	-	expression tag	UNP O76064
C	340	GLY	-	expression tag	UNP O76064
C	341	SER	-	expression tag	UNP O76064
C	342	PRO	-	expression tag	UNP O76064
C	343	GLU	-	expression tag	UNP O76064
C	344	PHE	-	expression tag	UNP O76064
G	337	GLY	-	expression tag	UNP O76064
G	338	PRO	-	expression tag	UNP O76064
G	339	LEU	-	expression tag	UNP O76064
G	340	GLY	-	expression tag	UNP O76064
G	341	SER	-	expression tag	UNP O76064
G	342	PRO	-	expression tag	UNP O76064
G	343	GLU	-	expression tag	UNP O76064
G	344	PHE	-	expression tag	UNP O76064
H	337	GLY	-	expression tag	UNP O76064
H	338	PRO	-	expression tag	UNP O76064
H	339	LEU	-	expression tag	UNP O76064
H	340	GLY	-	expression tag	UNP O76064
H	341	SER	-	expression tag	UNP O76064
H	342	PRO	-	expression tag	UNP O76064
H	343	GLU	-	expression tag	UNP O76064
H	344	PHE	-	expression tag	UNP O76064
K	337	GLY	-	expression tag	UNP O76064
K	338	PRO	-	expression tag	UNP O76064
K	339	LEU	-	expression tag	UNP O76064
K	340	GLY	-	expression tag	UNP O76064
K	341	SER	-	expression tag	UNP O76064
K	342	PRO	-	expression tag	UNP O76064

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Chain	Residue	Modelled	Actual	Comment	Reference
K	343	GLU	-	expression tag	UNP O76064
K	344	PHE	-	expression tag	UNP O76064
L	337	GLY	-	expression tag	UNP O76064
L	338	PRO	-	expression tag	UNP O76064
L	339	LEU	-	expression tag	UNP O76064
L	340	GLY	-	expression tag	UNP O76064
L	341	SER	-	expression tag	UNP O76064
L	342	PRO	-	expression tag	UNP O76064
L	343	GLU	-	expression tag	UNP O76064
L	344	PHE	-	expression tag	UNP O76064

- Molecule 4 is ZINC ION (three-letter code: ZN) (formula: Zn).

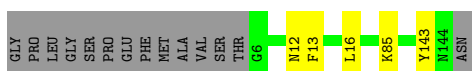
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	C	2	Total 2	Zn 2	0	0
4	G	2	Total 2	Zn 2	0	0
4	H	2	Total 2	Zn 2	0	0
4	K	2	Total 2	Zn 2	0	0
4	L	2	Total 2	Zn 2	0	0

### 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. 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.

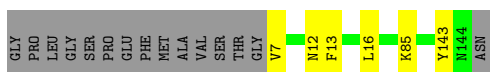
- Molecule 1: Ubiquitin-conjugating enzyme E2 variant 2

Chain A:  88% 9%




- Molecule 1: Ubiquitin-conjugating enzyme E2 variant 2

Chain E:  86% 10%



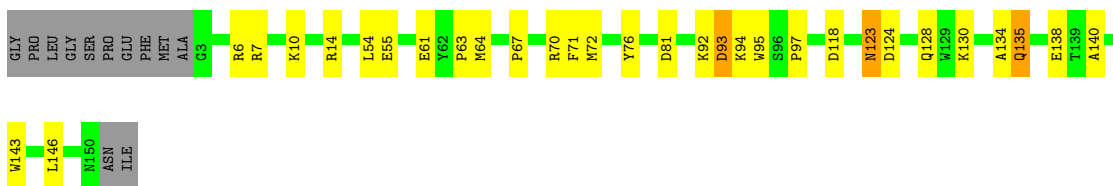
- Molecule 1: Ubiquitin-conjugating enzyme E2 variant 2

Chain I:  86% 10%



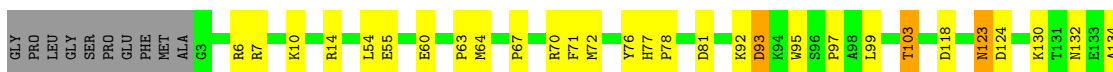
- Molecule 2: Ubiquitin-conjugating enzyme E2 N

Chain B:  73% 18% 8%



- Molecule 2: Ubiquitin-conjugating enzyme E2 N

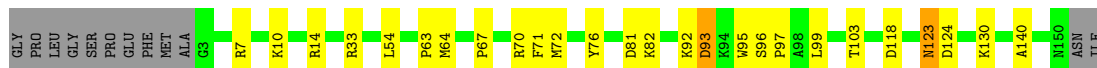
Chain F:  72% 18% 8%



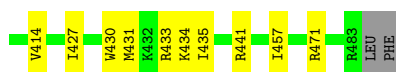
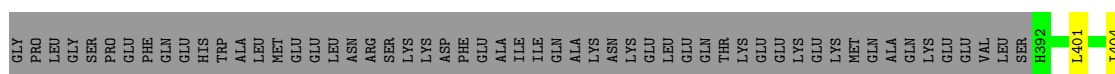




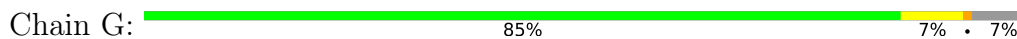
- Molecule 2: Ubiquitin-conjugating enzyme E2 N



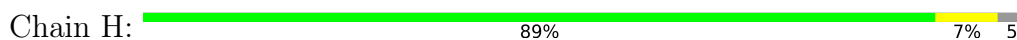
- Molecule 3: E3 ubiquitin-protein ligase RNF8



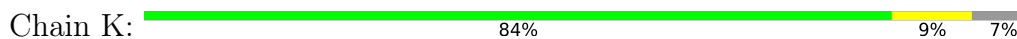
- Molecule 3: E3 ubiquitin-protein ligase RNF8



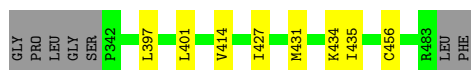
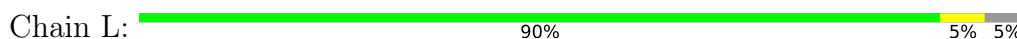
- Molecule 3: E3 ubiquitin-protein ligase RNF8



- Molecule 3: E3 ubiquitin-protein ligase RNF8



- Molecule 3: E3 ubiquitin-protein ligase RNF8



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 42 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	205.26Å 205.26Å 235.37Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	123.54 – 4.80 123.54 – 4.80	Depositor EDS
% Data completeness (in resolution range)	97.8 (123.54-4.80) 98.2 (123.54-4.80)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.71 (at 4.88Å)	Xtrriage
Refinement program	PHENIX 1.8.3_1479	Depositor
R, $R_{free}$	0.276 , 0.282 0.285 , 0.274	Depositor DCC
$R_{free}$ test set	1259 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	178.1	Xtrriage
Anisotropy	0.075	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 362.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.43$ , $\langle L^2 \rangle = 0.25$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.83	EDS
Total number of atoms	11524	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	258.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.38% 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

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section:  
ZN

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	0.28	0/1144	0.46	0/1547
1	E	0.28	0/1140	0.46	0/1542
1	I	0.28	0/1140	0.46	0/1542
2	B	0.32	0/1225	0.52	0/1666
2	F	0.35	1/1225 (0.1%)	0.52	0/1666
2	J	0.28	0/1225	0.49	0/1666
3	C	0.47	0/731	0.59	0/983
3	G	0.52	0/966	0.69	0/1312
3	H	0.45	0/980	0.65	0/1331
3	K	0.53	0/966	0.70	0/1312
3	L	0.44	0/980	0.65	0/1331
All	All	0.38	1/11722 (0.0%)	0.56	0/15898

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	F	138	GLU	CB-CG	-5.63	1.41	1.52

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 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	A	1121	0	1117	4	0
1	E	1117	0	1114	7	0
1	I	1117	0	1114	5	0
2	B	1192	0	1212	29	0
2	F	1192	0	1212	30	0
2	J	1192	0	1212	22	0
3	C	723	0	703	14	0
3	G	958	0	809	14	0
3	H	972	0	814	6	0
3	K	958	0	809	13	0
3	L	972	0	814	5	0
4	C	2	0	0	0	0
4	G	2	0	0	0	0
4	H	2	0	0	0	0
4	K	2	0	0	0	0
4	L	2	0	0	0	0
All	All	11524	0	10930	111	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 5.

The worst 5 of 111 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:B:64:MET:HE1	3:C:430:TRP:HA	1.28	1.14
2:F:64:MET:O	3:G:433:ARG:NH2	1.97	0.97
1:E:16:LEU:HD11	2:F:70:ARG:HD3	1.44	0.96
3:K:401:LEU:HD13	3:K:457:ILE:HG12	1.48	0.93
2:F:99:LEU:O	2:F:103:THR:OG1	1.91	0.89

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	140/153 (92%)	140 (100%)	0	0	100	100
1	E	139/153 (91%)	139 (100%)	0	0	100	100
1	I	139/153 (91%)	139 (100%)	0	0	100	100
2	B	148/160 (92%)	139 (94%)	7 (5%)	2 (1%)	11	46
2	F	148/160 (92%)	139 (94%)	7 (5%)	2 (1%)	11	46
2	J	148/160 (92%)	139 (94%)	7 (5%)	2 (1%)	11	46
3	C	90/149 (60%)	85 (94%)	5 (6%)	0	100	100
3	G	137/149 (92%)	132 (96%)	4 (3%)	1 (1%)	22	62
3	H	140/149 (94%)	134 (96%)	6 (4%)	0	100	100
3	K	137/149 (92%)	132 (96%)	4 (3%)	1 (1%)	22	62
3	L	140/149 (94%)	135 (96%)	5 (4%)	0	100	100
All	All	1506/1684 (89%)	1453 (96%)	45 (3%)	8 (0%)	29	68

5 of 8 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	123	ASN
2	B	124	ASP
2	F	123	ASN
2	F	124	ASP
3	G	397	LEU

### 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	127/135 (94%)	127 (100%)	0	100	100
1	E	127/135 (94%)	127 (100%)	0	100	100
1	I	127/135 (94%)	127 (100%)	0	100	100
2	B	128/135 (95%)	126 (98%)	2 (2%)	62	79
2	F	128/135 (95%)	125 (98%)	3 (2%)	50	70

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	J	128/135 (95%)	127 (99%)	1 (1%)	81	89
3	C	80/140 (57%)	79 (99%)	1 (1%)	69	82
3	G	80/140 (57%)	79 (99%)	1 (1%)	69	82
3	H	80/140 (57%)	78 (98%)	2 (2%)	47	68
3	K	80/140 (57%)	80 (100%)	0	100	100
3	L	80/140 (57%)	80 (100%)	0	100	100
All	All	1165/1510 (77%)	1155 (99%)	10 (1%)	78	87

5 of 10 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	H	404	ILE
3	H	433	ARG
2	J	93	ASP
2	F	93	ASP
2	F	103	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 5.3.3 RNA [i](#)

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 monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 10 ligands modelled in this entry, 10 are monoatomic - leaving 0 for Mogul analysis.

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.

No monomer is involved in short contacts.

## 5.7 Other polymers

There are no such residues in this entry.

## 5.8 Polymer linkage issues

There are no chain breaks in this entry.

## 6 Fit of model and data

### 6.1 Protein, DNA and RNA chains

Unable to reproduce the depositors R factor - this section is therefore empty.

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

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.3 Carbohydrates

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.4 Ligands

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.5 Other polymers

Unable to reproduce the depositors R factor - this section is therefore empty.