



# wwPDB X-ray Structure Validation Summary Report ⓘ

Oct 11, 2021 – 01:01 PM EDT

PDB ID : 2FQZ  
Title : Metal-depleted Ecl18kI in complex with uncleaved DNA  
Authors : Bochtler, M.; Szczepanowski, R.H.; Tamulaitis, G.; Grazulis, S.; Czapinska, H.; Manakova, E.; Siksnyis, V.  
Deposited on : 2006-01-18  
Resolution : 2.00 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.

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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 : 2.23.2  
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) : 2.23.2

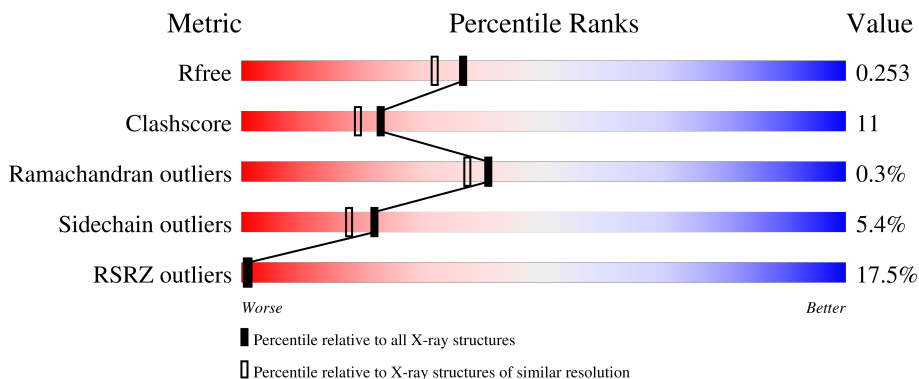
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.00 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.



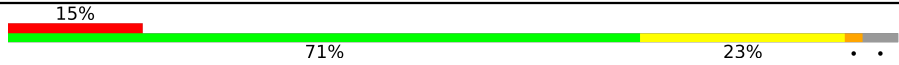


Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

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	E	9	 33% 67%
1	G	9	 22% 78%
2	F	9	 11% 11% 89%
2	H	9	 22% 78%
3	A	305	 25% 72% 20% • 5%

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Mol	Chain	Length	Quality of chain
3	B	305	
3	C	305	
3	D	305	

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 11645 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 DNA chain called DNA STRAND 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
1	E	9	364	172	74	102	16	0	9	0
1	G	9	364	172	74	102	16	0	9	0

- Molecule 2 is a DNA chain called DNA STRAND 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
2	F	9	362	172	68	106	16	0	9	0
2	H	9	362	172	68	106	16	0	9	0

- Molecule 3 is a protein called R.Ecl18kI.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	A	290	2393	1522	396	462	13	21	0	0
3	B	293	2421	1541	399	468	13	15	0	0
3	C	292	2412	1537	398	464	13	19	0	0
3	D	292	2412	1537	398	464	13	11	0	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	277	GLN	ARG	engineered mutation	UNP O87963
B	277	GLN	ARG	engineered mutation	UNP O87963
C	277	GLN	ARG	engineered mutation	UNP O87963
D	277	GLN	ARG	engineered mutation	UNP O87963

- Molecule 4 is water.

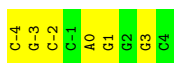
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	E	16	Total O 16 16	0	0
4	F	15	Total O 15 15	0	0
4	G	24	Total O 24 24	0	0
4	H	20	Total O 20 20	0	0
4	A	83	Total O 83 83	0	0
4	B	133	Total O 133 133	0	0
4	C	135	Total O 135 135	0	0
4	D	129	Total O 129 129	0	0

### 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 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.

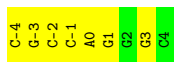
- Molecule 1: DNA STRAND 1

Chain E: 



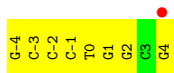
- Molecule 1: DNA STRAND 1

Chain G: 



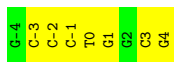
- Molecule 2: DNA STRAND 2

Chain F: 



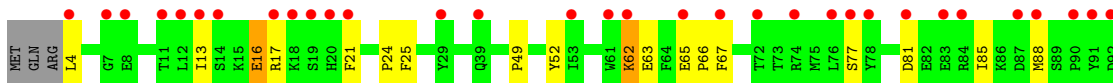
- Molecule 2: DNA STRAND 2

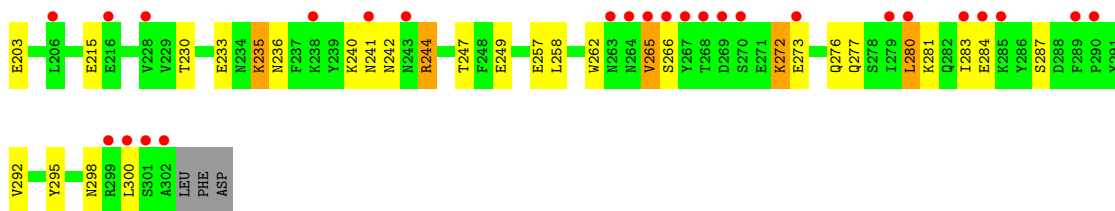
Chain H: 



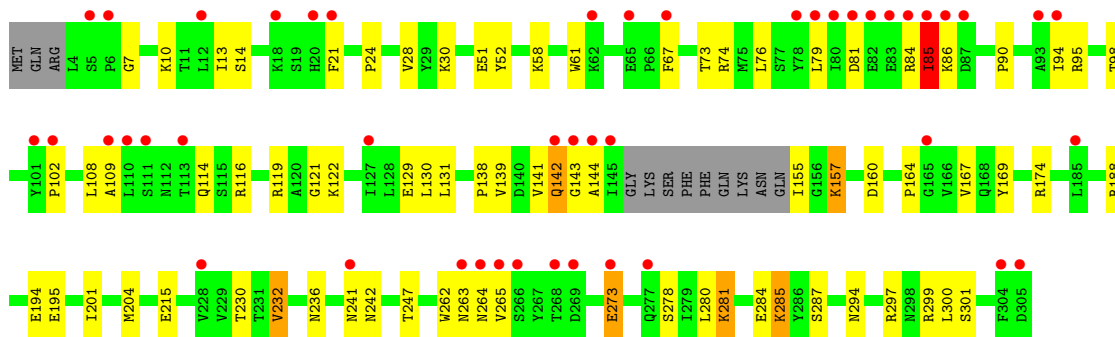
- Molecule 3: R.Ecl18kI

Chain A: 

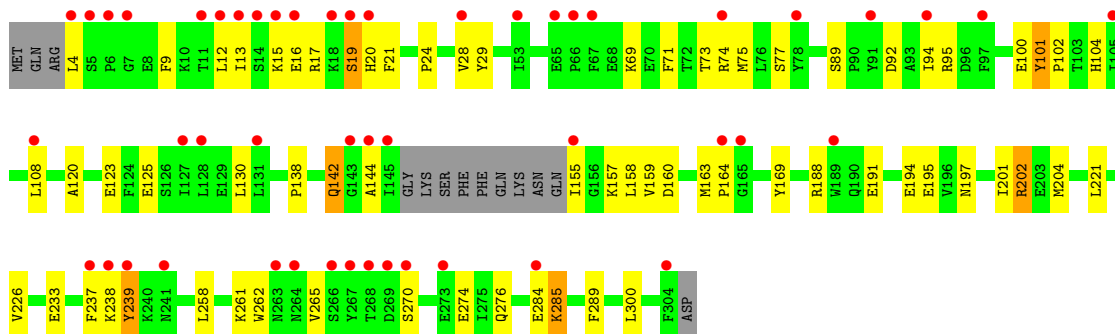
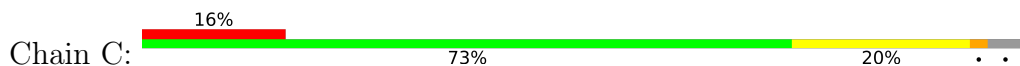




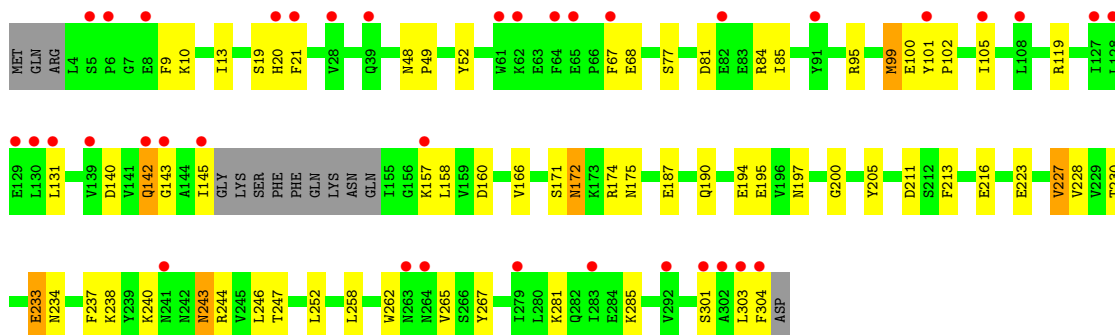
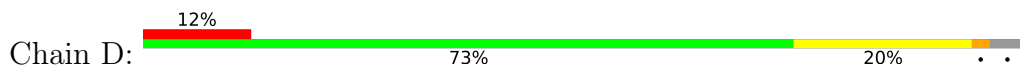
● Molecule 3: R.Ecl18kI



● Molecule 3: R.Ecl18kI



● Molecule 3: R.Ecl18kI



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	77.37Å 95.52Å 190.17Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 2.00 19.61 – 1.97	Depositor EDS
% Data completeness (in resolution range)	92.0 (20.00-2.00) 91.5 (19.61-1.97)	Depositor EDS
$R_{merge}$	0.03	Depositor
$R_{sym}$	0.03	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.99 (at 1.97Å)	Xtrriage
Refinement program	REFMAC 5.2.0005	Depositor
R, $R_{free}$	0.210 , 0.260 0.210 , 0.253	Depositor DCC
$R_{free}$ test set	4666 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	32.4	Xtrriage
Anisotropy	0.317	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 48.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	11645	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	38.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.52% 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](#)

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	E	0.43	0/408	0.69	0/626
1	G	0.59	0/408	0.82	0/626
2	F	0.44	0/404	0.70	0/620
2	H	0.48	0/404	0.76	0/620
3	A	0.52	0/2440	0.65	0/3293
3	B	0.57	0/2469	0.69	1/3331 (0.0%)
3	C	0.59	0/2460	0.70	1/3320 (0.0%)
3	D	0.59	0/2460	0.71	0/3320
All	All	0.56	0/11453	0.70	2/15756 (0.0%)

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
3	B	0	1

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	188	ARG	NE-CZ-NH1	5.43	123.02	120.30
3	B	188	ARG	NE-CZ-NH2	-5.06	117.77	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	B	241	ASN	Peptide

## 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	E	364	0	193	13	0
1	G	364	0	195	10	0
2	F	362	0	194	15	0
2	H	362	0	196	10	0
3	A	2393	0	2360	57	0
3	B	2421	0	2384	60	0
3	C	2412	0	2380	55	0
3	D	2412	0	2380	57	0
4	A	83	0	0	11	0
4	B	133	0	0	8	0
4	C	135	0	0	8	0
4	D	129	0	0	11	0
4	E	16	0	0	1	0
4	F	15	0	0	1	0
4	G	24	0	0	1	0
4	H	20	0	0	2	0
All	All	11645	0	10282	242	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 11.

The worst 5 of 242 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)
4:H:16:HOH:O	3:D:157:LYS:HG3	1.35	1.26
1:G:-3[A]:DG:H5''	3:C:157:LYS:HB2	1.21	1.20
3:D:160:ASP:HB3	4:D:398:HOH:O	1.52	1.09
2:H:-3[B]:DC:H5''	3:C:157:LYS:HB2	1.41	1.02
3:B:155:ILE:HD11	3:B:169:TYR:CE2	1.97	0.99

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	
3	A	286/305 (94%)	275 (96%)	11 (4%)	0	100	100
3	B	289/305 (95%)	278 (96%)	10 (4%)	1 (0%)	41	37
3	C	288/305 (94%)	274 (95%)	13 (4%)	1 (0%)	41	37
3	D	288/305 (94%)	283 (98%)	4 (1%)	1 (0%)	41	37
All	All	1151/1220 (94%)	1110 (96%)	38 (3%)	3 (0%)	41	37

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	D	172	ASN
3	B	85	ILE
3	C	101	TYR

### 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	
3	A	269/283 (95%)	252 (94%)	17 (6%)	18	13
3	B	272/283 (96%)	253 (93%)	19 (7%)	15	10
3	C	271/283 (96%)	262 (97%)	9 (3%)	38	37
3	D	271/283 (96%)	257 (95%)	14 (5%)	23	19
All	All	1083/1132 (96%)	1024 (95%)	59 (5%)	22	18

5 of 59 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	B	265	VAL
3	D	243	ASN
3	B	301	SER
3	D	233	GLU
3	D	145	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 11 such sidechains are listed below:

Mol	Chain	Res	Type
3	D	47	ASN
3	D	225	ASN
3	D	277	GLN
3	D	243	ASN
3	B	277	GLN

### 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](#)

There are no ligands in this entry.

## 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	E	9/9 (100%)	0.54	0 <span style="border: 1px solid blue; padding: 2px;">100</span> <span style="border: 1px solid blue; padding: 2px;">100</span>	33, 36, 42, 50	0
1	G	9/9 (100%)	0.36	0 <span style="border: 1px solid blue; padding: 2px;">100</span> <span style="border: 1px solid blue; padding: 2px;">100</span>	26, 27, 36, 42	0
2	F	9/9 (100%)	0.59	1 (11%) <span style="border: 1px solid red; padding: 2px;">5</span> <span style="border: 1px solid red; padding: 2px;">4</span>	29, 32, 46, 47	0
2	H	9/9 (100%)	0.32	0 <span style="border: 1px solid blue; padding: 2px;">100</span> <span style="border: 1px solid blue; padding: 2px;">100</span>	27, 29, 37, 39	0
3	A	290/305 (95%)	1.44	77 (26%) <span style="border: 1px solid red; padding: 2px;">0</span> <span style="border: 1px solid red; padding: 2px;">0</span>	25, 44, 65, 69	5 (1%)
3	B	293/305 (96%)	1.10	46 (15%) <span style="border: 1px solid red; padding: 2px;">2</span> <span style="border: 1px solid red; padding: 2px;">1</span>	21, 34, 53, 65	3 (1%)
3	C	292/305 (95%)	1.04	49 (16%) <span style="border: 1px solid red; padding: 2px;">1</span> <span style="border: 1px solid red; padding: 2px;">1</span>	22, 33, 53, 66	5 (1%)
3	D	292/305 (95%)	0.85	37 (12%) <span style="border: 1px solid red; padding: 2px;">3</span> <span style="border: 1px solid red; padding: 2px;">3</span>	21, 35, 51, 58	3 (1%)
All	All	1203/1256 (95%)	1.09	210 (17%) <span style="border: 1px solid red; padding: 2px;">1</span> <span style="border: 1px solid red; padding: 2px;">1</span>	21, 36, 57, 69	16 (1%)

The worst 5 of 210 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	B	145	ILE	12.2
3	C	78	TYR	7.8
3	B	144	ALA	7.1
3	A	264	ASN	7.0
3	C	4	LEU	6.8

### 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](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.