



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 06:56 PM GMT

PDB ID : 4N9X  
Title : Crystal Structure of the OCTAPRENYL-METHYL-METHOXY-BENZQ MOLECULE from *Erwinia carotovora* subsp. *atroseptica* strain SCRI 1043 / ATCC BAA-672, Northeast Structural Genomics Consortium (NESG) Target EwR161  
Authors : Kuzin, A.; Chen, Y.; Lew, S.; Seetharaman, J.; Mao, L.; Xiao, R.; Owens, L.A.; Wang, D.; Everett, J.K.; Acton, T.B.; Montelione, G.T.; Tong, L.; Hunt, J.F.; Northeast Structural Genomics Consortium (NESG)  
Deposited on : 2013-10-21  
Resolution : 2.50 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  
<http://wwpdb.org/validation/2016/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  
Mogul : 1.7 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20026688  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Refmac : 5.8.0135  
CCP4 : 6.5.0  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

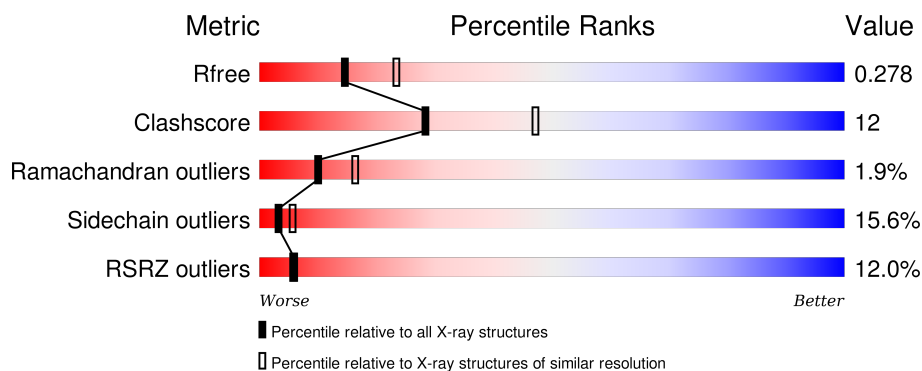
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.50 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))
$R_{free}$	91344	3553 (2.50-2.50)
Clashscore	102246	4242 (2.50-2.50)
Ramachandran outliers	100387	4156 (2.50-2.50)
Sidechain outliers	100360	4158 (2.50-2.50)
RSRZ outliers	91569	3562 (2.50-2.50)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. 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	411	<div> <div>10%</div> <div>61%</div> <div>22%</div> <div>7%</div> <div>10%</div> </div>

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 2902 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 Putative monooxygenase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	371	Total	C	N	O	S	Se	0	2	0
			2894	1834	523	520	4	13			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	404	LEU	-	EXPRESSION TAG	UNP Q6DA06
A	405	GLU	-	EXPRESSION TAG	UNP Q6DA06
A	406	HIS	-	EXPRESSION TAG	UNP Q6DA06
A	407	HIS	-	EXPRESSION TAG	UNP Q6DA06
A	408	HIS	-	EXPRESSION TAG	UNP Q6DA06
A	409	HIS	-	EXPRESSION TAG	UNP Q6DA06
A	410	HIS	-	EXPRESSION TAG	UNP Q6DA06
A	411	HIS	-	EXPRESSION TAG	UNP Q6DA06

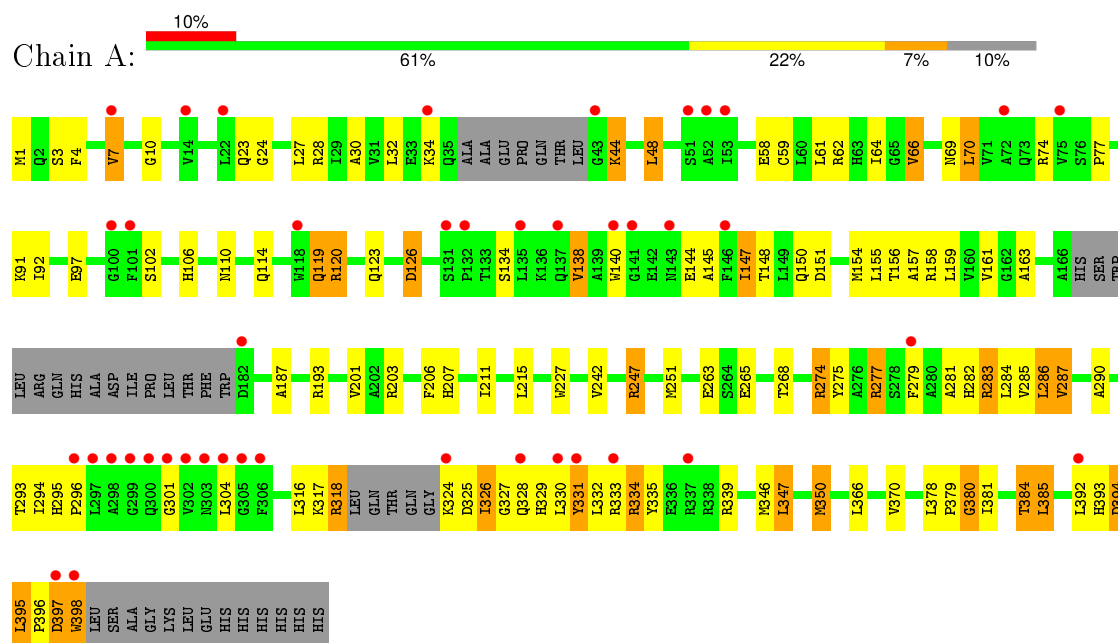
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	8	Total	O	0	0
			8	8		

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

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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 ( $\text{RSRZ} > 2$ ). 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: Putative monooxygenase



## 4 Data and refinement statistics

Property	Value	Source
Space group	H 3 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	120.10Å 120.10Å 149.92Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	28.81 – 2.50 28.81 – 2.50	Depositor EDS
% Data completeness (in resolution range)	96.8 (28.81-2.50) 96.7 (28.81-2.50)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.62 (at 2.51Å)	Xtriage
Refinement program	PHENIX (phenix.refine: dev_1269)	Depositor
R, $R_{free}$	0.225 , 0.266 0.236 , 0.278	Depositor DCC
$R_{free}$ test set	694 reflections (5.10%)	DCC
Wilson B-factor (Å <sup>2</sup> )	59.7	Xtriage
Anisotropy	0.110	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 66.4	EDS
Estimated twinning fraction	0.019 for -2/3*h-1/3*k+2/3*l,-1/3*h-2/3*k-2/3*l,2/3*h-2/3*k+1/3*l 0.016 for -h,1/3*h-1/3*k+2/3*l,2/3*h+4/3*k+1/3*l 0.009 for -1/3*h+1/3*k-2/3*l,-k,-4/3*h-2/3*k+1/3*l	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.51$ , $\langle L^2 \rangle = 0.35$	Xtriage
Outliers	1 of 14063 reflections (0.007%)	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	2902	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	85.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.65% 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, 0.375 respectively for untwinned datasets, and 0.333, 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	A	0.51	0/2945	0.67	2/3961 (0.1%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
1	A	380	GLY	N-CA-C	-6.34	97.25	113.10
1	A	70	LEU	CA-CB-CG	5.48	127.91	115.30

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	2894	0	2890	67	0
2	A	8	0	0	1	0
All	All	2902	0	2890	67	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 12.

All (67) 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:23:GLN:OE1	1:A:24:GLY:N	2.16	0.79
1:A:318:ARG:HE	1:A:318:ARG:H	1.34	0.76
1:A:74:ARG:NH1	2:A:508:HOH:O	2.21	0.73
1:A:381:ILE:HA	1:A:384:THR:HG23	1.71	0.72
1:A:193:ARG:NE	1:A:263:GLU:OE2	2.19	0.71
1:A:334:ARG:HH21	1:A:335:TYR:HB2	1.56	0.71
1:A:247:ARG:NH1	1:A:251:MSE:HG3	2.06	0.70
1:A:158:ARG:O	1:A:283:ARG:NH1	2.26	0.68
1:A:159:LEU:HD11	1:A:285:VAL:HG23	1.76	0.67
1:A:281:ALA:HB3	1:A:284:LEU:HB3	1.78	0.66
1:A:296:PRO:HD2	1:A:346:MSE:HE3	1.80	0.64
1:A:207[B]:HIS:HE1	1:A:227:TRP:HE1	1.45	0.64
1:A:150:GLN:NE2	1:A:151:ASP:OD1	2.31	0.63
1:A:393:HIS:O	1:A:395:LEU:N	2.29	0.61
1:A:4:PHE:HE2	1:A:155:LEU:HD11	1.65	0.61
1:A:69:ASN:ND2	1:A:119:GLN:OE1	2.34	0.60
1:A:4:PHE:CE2	1:A:155:LEU:HD11	2.37	0.60
1:A:7:VAL:HG13	1:A:157:ALA:HB2	1.84	0.59
1:A:296:PRO:HA	1:A:350[A]:MSE:HE2	1.86	0.58
1:A:296:PRO:HD2	1:A:346:MSE:CE	2.34	0.58
1:A:134:SER:N	1:A:150:GLN:OE1	2.35	0.57
1:A:110:ASN:O	1:A:114:GLN:HG2	2.04	0.56
1:A:163:ALA:HB2	1:A:287:VAL:HG13	1.88	0.56
1:A:66:VAL:HG23	1:A:120:ARG:HG3	1.88	0.56
1:A:324:LYS:HD2	1:A:331:TYR:OH	2.06	0.56
1:A:290:ALA:O	1:A:293:THR:HG22	2.07	0.56
1:A:295:HIS:CD2	1:A:346:MSE:HE2	2.44	0.53
1:A:332:LEU:O	1:A:335:TYR:HB3	2.11	0.51
1:A:148:THR:HG22	1:A:154:MSE:SE	2.62	0.50
1:A:187:ALA:O	1:A:268:THR:HA	2.12	0.50
1:A:201:VAL:HB	1:A:203:ARG:NH1	2.28	0.49
1:A:145:ALA:H	1:A:157:ALA:H	1.61	0.48
1:A:92:ILE:HD13	1:A:385:LEU:HD21	1.95	0.48
1:A:277:ARG:NH1	1:A:304:LEU:HB3	2.28	0.48
1:A:334:ARG:HG3	1:A:334:ARG:H	1.37	0.48
1:A:325:ASP:O	1:A:327:GLY:N	2.45	0.48
1:A:290:ALA:HB1	1:A:301:GLY:O	2.14	0.48
1:A:144:GLU:HB3	1:A:156:THR:HB	1.96	0.48
1:A:324:LYS:NZ	1:A:328:GLN:HE22	2.12	0.47
1:A:44:LYS:H	1:A:44:LYS:NZ	2.12	0.47
1:A:316:LEU:HA	1:A:316:LEU:HD12	1.78	0.46
1:A:61:LEU:HA	1:A:64:ILE:HG12	1.97	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:159:LEU:HD12	1:A:283:ARG:C	2.36	0.45
1:A:397:ASP:N	1:A:398:TRP:HA	2.32	0.45
1:A:147:ILE:HG12	1:A:155:LEU:HB3	1.99	0.45
1:A:279:PHE:HB3	1:A:286:LEU:HB2	1.98	0.44
1:A:329:HIS:CG	1:A:329:HIS:O	2.70	0.44
1:A:91:LYS:HB3	1:A:91:LYS:HE2	1.69	0.44
1:A:126:ASP:OD2	1:A:126:ASP:N	2.39	0.43
1:A:330:LEU:C	1:A:332:LEU:H	2.21	0.43
1:A:77:PRO:HG3	1:A:106:HIS:NE2	2.34	0.43
1:A:48:LEU:HD13	1:A:48:LEU:HA	1.86	0.43
1:A:347:LEU:HD12	1:A:347:LEU:HA	1.70	0.42
1:A:274:ARG:HD3	1:A:275:TYR:CZ	2.55	0.42
1:A:393:HIS:C	1:A:395:LEU:H	2.19	0.41
1:A:282:HIS:ND1	1:A:283:ARG:HG2	2.35	0.41
1:A:316:LEU:O	1:A:318:ARG:N	2.53	0.41
1:A:282:HIS:CE1	1:A:283:ARG:HE	2.38	0.41
1:A:58:GLU:OE2	1:A:62:ARG:NH1	2.48	0.41
1:A:206:PHE:CZ	1:A:350[A]:MSE:HE1	2.55	0.41
1:A:140:TRP:CH2	1:A:284:LEU:HB2	2.55	0.41
1:A:294:ILE:HG23	1:A:350[B]:MSE:HE1	2.03	0.41
1:A:4:PHE:CG	1:A:30:ALA:HB2	2.56	0.41
1:A:274:ARG:N	1:A:274:ARG:CD	2.84	0.41
1:A:138:VAL:HG23	1:A:147:ILE:HG22	2.03	0.40
1:A:44:LYS:CE	1:A:44:LYS:H	2.35	0.40
1:A:379:PRO:HA	1:A:380:GLY:HA2	1.63	0.40

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
1	A	365/411 (89%)	335 (92%)	23 (6%)	7 (2%)	10 16



All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	277	ARG
1	A	283	ARG
1	A	317	LYS
1	A	326	ILE
1	A	394	ASP
1	A	396	PRO
1	A	10	GLY

### 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	304/324 (94%)	256 (84%)	48 (16%)	<b>3</b> <b>5</b>

All (48) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1	MSE
1	A	3	SER
1	A	7	VAL
1	A	27	LEU
1	A	28	ARG
1	A	32	LEU
1	A	34	LYS
1	A	44	LYS
1	A	48	LEU
1	A	59	CYS
1	A	66	VAL
1	A	70	LEU
1	A	97	GLU
1	A	102	SER
1	A	119	GLN
1	A	120	ARG
1	A	123	GLN
1	A	126	ASP

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Mol	Chain	Res	Type
1	A	138	VAL
1	A	147	ILE
1	A	161	VAL
1	A	211	ILE
1	A	215	LEU
1	A	242	VAL
1	A	247	ARG
1	A	265	GLU
1	A	274	ARG
1	A	286	LEU
1	A	287	VAL
1	A	318	ARG
1	A	326	ILE
1	A	331	TYR
1	A	333	ARG
1	A	334	ARG
1	A	339	ARG
1	A	347	LEU
1	A	350[A]	MSE
1	A	350[B]	MSE
1	A	366	LEU
1	A	370	VAL
1	A	378	LEU
1	A	384	THR
1	A	385	LEU
1	A	392	LEU
1	A	394	ASP
1	A	395	LEU
1	A	397	ASP
1	A	398	TRP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	69	ASN
1	A	119	GLN
1	A	328	GLN

### 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 carbohydrates 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 ⓘ

### 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	359/411 (87%)	0.57	43 (11%) 6 6	49, 78, 134, 152	0

All (43) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	302	VAL	5.2
1	A	101	PHE	5.2
1	A	331	TYR	5.1
1	A	137	GLN	5.0
1	A	146	PHE	4.8
1	A	279	PHE	4.5
1	A	72	ALA	4.1
1	A	304	LEU	4.0
1	A	132	PRO	3.7
1	A	34	LYS	3.7
1	A	52	ALA	3.6
1	A	297	LEU	3.5
1	A	333	ARG	3.4
1	A	43	GLY	3.3
1	A	118	TRP	3.2
1	A	140	TRP	3.2
1	A	337	ARG	3.1
1	A	392	LEU	3.1
1	A	298	ALA	3.1
1	A	299	GLY	2.9
1	A	53	ILE	2.8
1	A	296	PRO	2.8
1	A	182	ASP	2.8
1	A	135	LEU	2.8
1	A	303	ASN	2.8
1	A	330	LEU	2.7
1	A	51	SER	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	328	GLN	2.6
1	A	141	GLY	2.6
1	A	305	GLY	2.5
1	A	301	GLY	2.5
1	A	22	LEU	2.4
1	A	398	TRP	2.4
1	A	324	LYS	2.4
1	A	306	PHE	2.3
1	A	75	VAL	2.3
1	A	14	VAL	2.2
1	A	143	ASN	2.1
1	A	300	GLN	2.1
1	A	100	GLY	2.1
1	A	397	ASP	2.1
1	A	131	SER	2.1
1	A	7	VAL	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 carbohydrates 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.