



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 25, 2024 – 03:13 AM EDT

PDB ID : 6CMK  
Title : Crystal structure of Citrobacter koseri AztD  
Authors : Yukl, E.T.  
Deposited on : 2018-03-05  
Resolution : 1.73 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 : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.37.1  
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) : 2.37.1

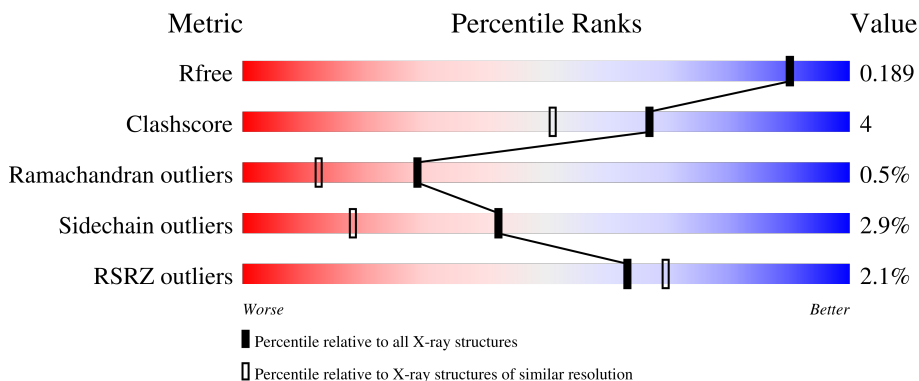
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.73 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	3764 (1.76-1.72)
Clashscore	141614	3923 (1.76-1.72)
Ramachandran outliers	138981	3878 (1.76-1.72)
Sidechain outliers	138945	3878 (1.76-1.72)
RSRZ outliers	127900	3705 (1.76-1.72)

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	421	 0% 82% 6% • 11%
1	B	421	 3% 79% 8% • 11%

## 2 Entry composition i

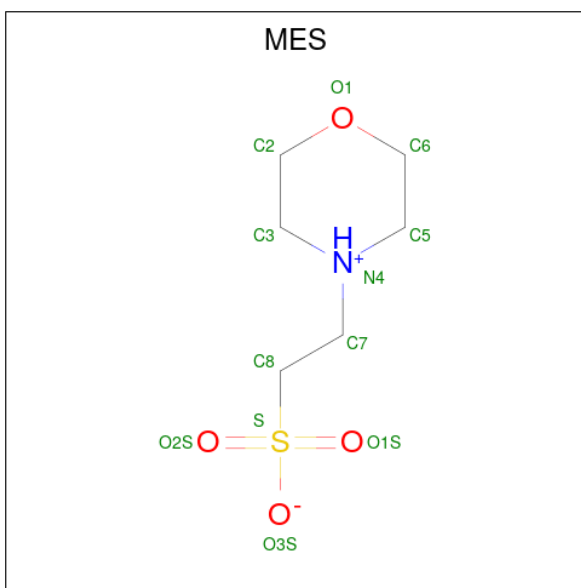
There are 7 unique types of molecules in this entry. The entry contains 12143 atoms, of which 5663 are hydrogens and 0 are deuteriums.

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 AztD protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	H	N	O				S
1	B	373	Total	C	H	N	O	S	0	5	0
			5660	1819	2797	499	541	4			
1	A	375	Total	C	H	N	O	S	0	5	0
			5675	1827	2792	507	545	4			

- Molecule 2 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (three-letter code: MES) (formula: C<sub>6</sub>H<sub>13</sub>NO<sub>4</sub>S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	H	N	O			S
2	B	1	Total	C	H	N	O	S	0	0
			25	6	13	1	4	1		
2	A	1	Total	C	H	N	O	S	0	0
			25	6	13	1	4	1		

- Molecule 3 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	2	Total	Zn	0	0
			2	2		
3	A	2	Total	Zn	0	0
			2	2		

- Molecule 4 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula:  $C_2H_6O_2$ ).



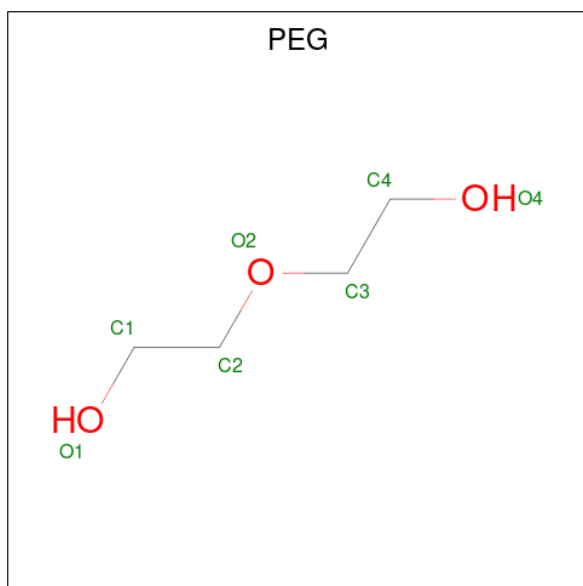
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	B	1	Total	C	H	O	0	0
			10	2	6	2		
4	B	1	Total	C	H	O	0	0
			10	2	6	2		
4	A	1	Total	C	H	O	0	0
			10	2	6	2		
4	A	1	Total	C	H	O	0	0
			10	2	6	2		

- Molecule 5 is TRIETHYLENE GLYCOL (three-letter code: PGE) (formula:  $C_6H_{14}O_4$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	H	O		
5	A	1	24	6	14	4	0	0

- Molecule 6 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula:  $C_4H_{10}O_3$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	H	O		
6	A	1	17	4	10	3	0	0

- Molecule 7 is water.

<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
7	B	299	Total 299	O 299	0	0
7	A	371	Total 374	O 374	0	3



## 4 Data and refinement statistics i

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	54.23Å 128.79Å 56.85Å 90.00° 105.20° 90.00°	Depositor
Resolution (Å)	64.39 – 1.73 64.39 – 1.73	Depositor EDS
% Data completeness (in resolution range)	99.1 (64.39-1.73) 99.1 (64.39-1.73)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.63 (at 1.73Å)	Xtrriage
Refinement program	PHENIX (1.12_2829: ???)	Depositor
R, $R_{free}$	0.153 , 0.188 0.153 , 0.189	Depositor DCC
$R_{free}$ test set	1997 reflections (2.58%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	18.1	Xtrriage
Anisotropy	0.623	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.38 , 51.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	0.035 for l,-k,h	Xtrriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	12143	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	30.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.06% 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: MES, PEG, ZN, PGE, EDO

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	0.32	0/2946	0.61	0/4006
1	B	0.34	0/2926	0.63	2/3980 (0.1%)
All	All	0.33	0/5872	0.62	2/7986 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	303	PHE	CB-CG-CD1	5.60	124.72	120.80
1	B	303	PHE	CB-CG-CD2	-5.03	117.28	120.80

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	2883	2792	2882	17	0
1	B	2863	2797	2869	27	0
2	A	12	13	13	0	0
2	B	12	13	13	0	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
4	A	8	12	12	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	8	12	12	1	0
5	A	10	14	14	0	0
6	A	7	10	10	0	0
7	A	374	0	0	5	2
7	B	299	0	0	7	2
All	All	6480	5663	5825	45	2

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 4.

All (45) 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:B:326:ASP:OD1	7:B:601:HOH:O	1.91	0.88
1:B:324:GLN:NE2	7:B:603:HOH:O	2.08	0.86
1:A:303:PHE:HB3	1:A:315[A]:VAL:HG12	1.60	0.83
1:B:149:GLU:OE1	7:B:602:HOH:O	2.00	0.79
1:A:347:HIS:O	1:A:352:ARG:NH2	2.23	0.71
1:B:310:ALA:O	7:B:604:HOH:O	2.09	0.69
1:B:365:THR:HG22	1:B:372:ILE:HD12	1.73	0.69
1:A:117:LEU:HD22	1:A:152:VAL:HG22	1.77	0.67
1:B:278:ASP:OD1	7:B:605:HOH:O	2.14	0.64
1:A:44:ASP:OD2	1:A:391:GLN:NE2	2.31	0.63
1:A:278:ASP:OD1	7:A:601:HOH:O	2.16	0.62
4:B:505:EDO:O1	7:B:606:HOH:O	2.16	0.61
1:A:311:LYS:NZ	7:A:606:HOH:O	2.35	0.60
1:B:74:GLU:N	1:B:129:GLU:OE1	2.28	0.60
1:A:326:ASP:OD1	7:A:602:HOH:O	2.16	0.60
1:A:303:PHE:CB	1:A:315[A]:VAL:HG12	2.31	0.58
1:A:192[B]:ARG:NH1	7:A:604:HOH:O	2.23	0.58
1:A:148:GLY:O	1:A:152:VAL:HG23	2.03	0.57
1:A:91:THR:HG21	1:A:117:LEU:HD23	1.86	0.56
1:B:103:ASP:OD1	1:B:104[B]:HIS:N	2.41	0.53
1:B:405:HIS:ND1	1:B:405:HIS:O	2.41	0.53
1:B:355[B]:ILE:HD12	1:B:364:VAL:HG22	1.91	0.53
1:B:192:ARG:NH2	1:B:230:GLU:OE2	2.42	0.52
1:B:103:ASP:O	1:B:104[A]:HIS:O	2.29	0.51
1:A:113:LYS:NZ	7:A:608:HOH:O	2.43	0.50
1:B:104[B]:HIS:O	1:B:105:ALA:HB2	2.12	0.49
1:A:348:TRP:HA	1:A:352:ARG:HH22	1.77	0.49
1:B:65:LYS:NZ	1:B:118:GLU:OE2	2.47	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:99:HIS:CE1	1:B:106:ASP:HB2	2.50	0.46
1:B:371:LYS:HE3	1:B:373:ILE:HD11	1.99	0.44
1:A:117:LEU:HD22	1:A:152:VAL:CG2	2.47	0.44
1:B:101:HIS:N	1:B:104[A]:HIS:O	2.49	0.44
1:B:91:THR:OG1	1:B:115:LEU:HB2	2.17	0.44
1:B:355[A]:ILE:HG22	1:B:356:ALA:N	2.33	0.44
1:A:200:ASP:OD2	1:A:204:LYS:NZ	2.42	0.43
1:B:101:HIS:HB2	1:B:104[A]:HIS:HB3	2.00	0.42
1:B:266:LYS:NZ	7:B:609:HOH:O	2.49	0.42
1:A:311:LYS:HG3	1:A:312:PHE:CD2	2.55	0.42
1:B:404:VAL:O	1:B:405:HIS:ND1	2.53	0.41
1:B:372:ILE:HD11	1:B:392:PRO:HB2	2.02	0.41
1:A:283:VAL:HA	1:A:290:SER:O	2.21	0.41
1:B:65:LYS:HD2	1:B:88:VAL:HG11	2.03	0.41
1:B:129:GLU:HG3	1:B:134:ILE:CG1	2.51	0.40
1:B:134:ILE:O	1:B:146:ILE:HA	2.21	0.40
1:B:188:ASP:OD1	1:B:191:LYS:HD2	2.21	0.40

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:B:792:HOH:O	7:A:959:HOH:O[1_556]	1.94	0.26
7:B:878:HOH:O	7:A:614:HOH:O[2_545]	2.14	0.06

## 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	378/421 (90%)	364 (96%)	14 (4%)	0	<a href="#">100</a> <a href="#">100</a>
1	B	376/421 (89%)	357 (95%)	14 (4%)	5 (1%)	<a href="#">12</a> <a href="#">2</a>

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	754/842 (90%)	721 (96%)	28 (4%)	5 (1%)	29 8

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	104[A]	HIS
1	B	104[B]	HIS
1	B	103	ASP
1	B	187	ASP
1	B	105	ALA

### 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	312/348 (90%)	300 (96%)	12 (4%)	33 11
1	B	311/348 (89%)	304 (98%)	7 (2%)	50 27
All	All	623/696 (90%)	604 (97%)	19 (3%)	42 17

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	99	HIS
1	B	147	LEU
1	B	157	LYS
1	B	187	ASP
1	B	202	GLN
1	B	303	PHE
1	B	389	GLU
1	A	59	LEU
1	A	147	LEU
1	A	192[A]	ARG
1	A	192[B]	ARG
1	A	204	LYS
1	A	212	CYS

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Mol	Chain	Res	Type
1	A	243	PRO
1	A	266	LYS
1	A	289	ASP
1	A	303	PHE
1	A	344	MET
1	A	347	HIS

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 12 ligands modelled in this entry, 4 are monoatomic - leaving 8 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	$\# Z  > 2$
5	PGE	A	506	-	9,9,9	0.34	0	8,8,8	0.33	0
4	EDO	B	505	-	3,3,3	0.45	0	2,2,2	0.21	0
6	PEG	A	507	-	6,6,6	0.48	0	5,5,5	0.31	0
2	MES	A	501	-	12,12,12	1.82	1 (8%)	14,16,16	1.40	1 (7%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
4	EDO	A	505	-	3,3,3	0.45	0	2,2,2	0.30	0
4	EDO	B	504	-	3,3,3	0.45	0	2,2,2	0.26	0
4	EDO	A	504	-	3,3,3	0.46	0	2,2,2	0.34	0
2	MES	B	501	-	12,12,12	1.98	1 (8%)	14,16,16	1.61	4 (28%)

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
5	PGE	A	506	-	-	0/7/7/7	-
4	EDO	B	505	-	-	0/1/1/1	-
6	PEG	A	507	-	-	3/4/4/4	-
2	MES	A	501	-	-	0/6/14/14	0/1/1/1
4	EDO	A	505	-	-	0/1/1/1	-
4	EDO	B	504	-	-	1/1/1/1	-
4	EDO	A	504	-	-	1/1/1/1	-
2	MES	B	501	-	-	1/6/14/14	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	501	MES	C8-S	-6.59	1.68	1.77
2	A	501	MES	C8-S	-5.96	1.69	1.77

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	501	MES	O1S-S-C8	3.96	111.68	106.92
2	B	501	MES	O1S-S-C8	3.21	110.78	106.92
2	B	501	MES	C6-C5-N4	-2.81	105.85	110.10
2	B	501	MES	O2S-S-C8	2.55	109.99	106.92
2	B	501	MES	C5-N4-C3	2.26	113.92	108.83

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	507	PEG	O2-C3-C4-O4
4	A	504	EDO	O1-C1-C2-O2

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Mol	Chain	Res	Type	Atoms
2	B	501	MES	N4-C7-C8-S
6	A	507	PEG	O1-C1-C2-O2
6	A	507	PEG	C1-C2-O2-C3
4	B	504	EDO	O1-C1-C2-O2

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	505	EDO	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 [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	A	375/421 (89%)	-0.38	5 (1%) 77 82	11, 23, 48, 82	0
1	B	373/421 (88%)	-0.16	11 (2%) 51 57	10, 24, 63, 120	0
All	All	748/842 (88%)	-0.27	16 (2%) 63 70	10, 23, 55, 120	0

All (16) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	103	ASP	9.3
1	B	102	GLY	7.3
1	B	104[A]	HIS	5.1
1	B	240	ASN	4.5
1	B	405	HIS	3.6
1	A	348	TRP	3.6
1	B	404	VAL	3.5
1	B	101	HIS	3.4
1	B	152	VAL	3.1
1	A	347	HIS	3.1
1	A	346	GLY	3.0
1	B	100	ASP	3.0
1	B	99	HIS	2.8
1	A	288	SER	2.5
1	A	289	ASP	2.3
1	B	187	ASP	2.1

### 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](#)

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	EDO	B	505	4/4	0.75	0.10	46,55,63,63	0
6	PEG	A	507	7/7	0.77	0.15	46,66,91,91	0
4	EDO	A	504	4/4	0.79	0.16	61,74,81,86	0
5	PGE	A	506	10/10	0.90	0.14	28,44,58,58	0
4	EDO	B	504	4/4	0.90	0.06	51,61,67,68	0
3	ZN	B	502	1/1	0.93	0.05	64,64,64,64	0
4	EDO	A	505	4/4	0.93	0.08	46,56,67,67	0
3	ZN	A	503	1/1	0.94	0.05	36,36,36,36	1
3	ZN	A	502	1/1	0.96	0.07	37,37,37,37	1
2	MES	B	501	12/12	0.97	0.11	17,71,90,94	0
2	MES	A	501	12/12	0.98	0.09	18,24,29,30	0
3	ZN	B	503	1/1	0.99	0.06	23,23,23,23	1

### 6.5 Other polymers [i](#)

There are no such residues in this entry.