



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 19, 2025 – 04:14 AM EDT

PDB ID : 1JGM  
Title : High Resolution Structure of the Cadmium-containing Phosphotriesterase from *Pseudomonas diminuta*  
Authors : Benning, M.M.; Shim, H.; Raushel, F.M.; Holden, H.M.  
Deposited on : 2001-06-26  
Resolution : 1.30 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	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.41.4

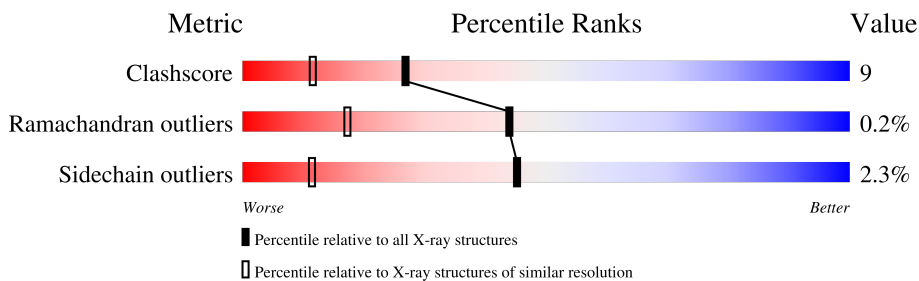
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 1.30 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	180529	1497 (1.30-1.30)
Ramachandran outliers	177936	1455 (1.30-1.30)
Sidechain outliers	177891	1455 (1.30-1.30)

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	A	336	 74% 21% . .
1	B	336	 77% 18% . .

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
4	EDO	A	23	-	-	X	-

## 2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 5997 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 Phosphotriesterase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	333	Total	C	N	O	S	0	7	0
			2552	1612	454	479	7			
1	B	332	Total	C	N	O	S	0	9	0
			2558	1614	458	479	7			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	169	KCX	LYS	modified residue	UNP P0A434
B	169	KCX	LYS	modified residue	UNP P0A434

- Molecule 2 is CADMIUM ION (three-letter code: CD) (formula: Cd).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	2	Total	Cd	0	0
			2	2		
2	B	2	Total	Cd	0	0
			2	2		

- Molecule 3 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Na	0	0
			1	1		
3	B	1	Total	Na	0	0
			1	1		

- Molecule 4 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



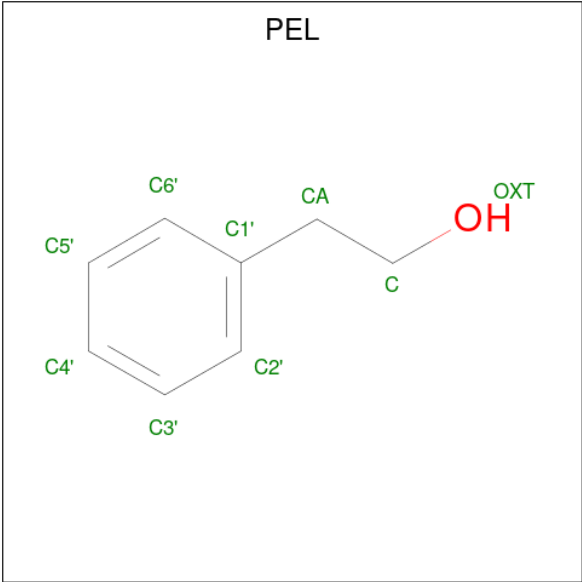
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		

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

- Molecule 5 is 2-PHENYL-ETHANOL (three-letter code: PEL) (formula: C<sub>8</sub>H<sub>10</sub>O).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			9	8	1		
5	A	1	Total	C	O	0	1
			13	10	3		
5	B	1	Total	C	O	0	0
			9	8	1		

- Molecule 6 is water.

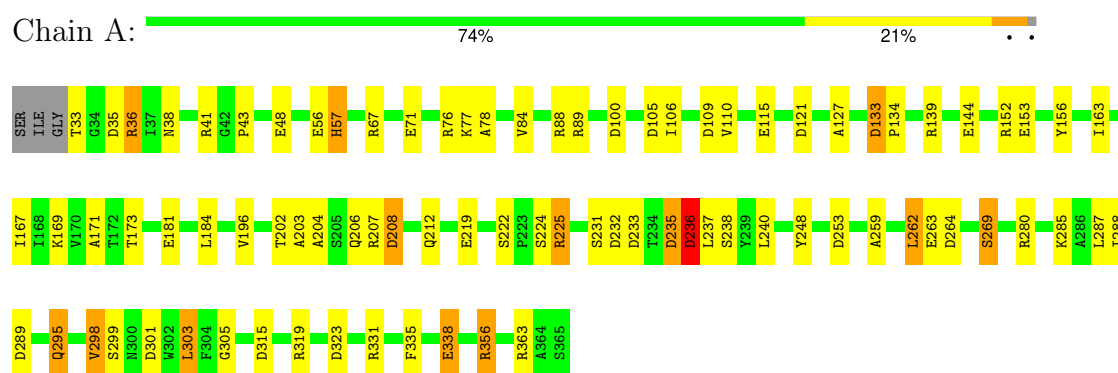
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	355	Total	O	0	0
			355	355		
6	B	385	Total	O	0	0
			385	385		

### 3 Residue-property plots

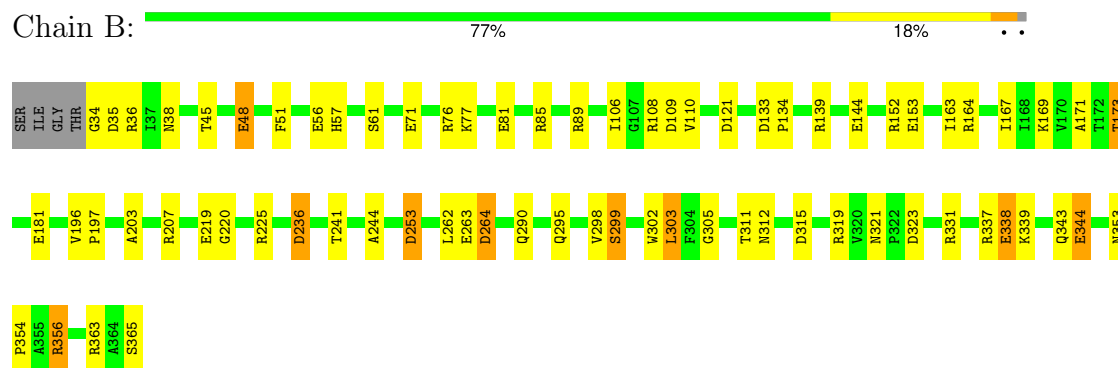
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded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



#### • Molecule 1: Phosphotriesterase



## 4 Data and refinement statistics

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

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	128.45Å 90.03Å 68.39Å 90.00° 91.72° 90.00°	Depositor
Resolution (Å)	30.00 – 1.30	Depositor
% Data completeness (in resolution range)	(Not available) (30.00-1.30)	Depositor
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	TNT	Depositor
R, $R_{free}$	0.202 , 0.236	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	5997	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	20.0	wwPDB-VP



## 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: PEL, EDO, NA, CD, KCX

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	0.95	11/2622 (0.4%)	1.45	55/3563 (1.5%)
1	B	0.91	11/2648 (0.4%)	1.35	34/3596 (0.9%)
All	All	0.93	22/5270 (0.4%)	1.40	89/7159 (1.2%)

The worst 5 of 22 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	56	GLU	CD-OE2	7.24	1.33	1.25
1	A	219	GLU	CD-OE2	6.67	1.32	1.25
1	B	338	GLU	CD-OE2	6.54	1.32	1.25
1	B	153	GLU	CD-OE2	6.47	1.32	1.25
1	B	81	GLU	CD-OE2	6.17	1.32	1.25

The worst 5 of 89 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	356	ARG	NE-CZ-NH1	13.45	127.02	120.30
1	B	89	ARG	NE-CZ-NH2	-12.64	113.98	120.30
1	A	89	ARG	NE-CZ-NH2	-12.35	114.12	120.30
1	A	67	ARG	NE-CZ-NH2	-10.20	115.20	120.30
1	B	139	ARG	NE-CZ-NH1	10.06	125.33	120.30

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	2552	0	2576	49	1
1	B	2558	0	2581	38	1
2	A	2	0	0	0	0
2	B	2	0	0	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	60	0	90	16	0
4	B	50	0	78	12	0
5	A	22	0	25	0	0
5	B	9	0	10	0	0
6	A	355	0	0	11	1
6	B	385	0	0	15	0
All	All	5997	0	5360	96	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 9.

The worst 5 of 96 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:263:GLU:HA	6:B:689:HOH:O	1.81	0.80
1:A:222[A]:SER:HB2	1:A:363:ARG:HH21	1.49	0.77
1:B:319:ARG:NH1	6:B:690:HOH:O	2.16	0.76
1:A:225:ARG:HH21	4:A:23:EDO:C2	1.99	0.75
1:B:241:THR:HG21	1:B:290:GLN:HE21	1.52	0.75

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)
1:A:236:ASP:OD1	1:A:236:ASP:OD1[2_656]	2.02	0.18
1:B:34:GLY:N	6:A:708:HOH:O[4_546]	2.19	0.01

## 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	337/336 (100%)	323 (96%)	13 (4%)	1 (0%)	37	15
1	B	339/336 (101%)	326 (96%)	13 (4%)	0	100	100
All	All	676/672 (101%)	649 (96%)	26 (4%)	1 (0%)	44	18

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	236	ASP

### 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	
1	A	272/268 (102%)	264 (97%)	8 (3%)	37	6
1	B	275/268 (103%)	269 (98%)	6 (2%)	47	13
All	All	547/536 (102%)	533 (97%)	14 (3%)	45	8

5 of 14 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	303	LEU
1	B	36	ARG
1	B	365	SER
1	B	299	SER
1	B	303	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	38	ASN
1	A	212	GLN
1	B	38	ASN
1	B	212	GLN
1	B	290	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

2 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	KCX	B	169	1,2	10,11,12	1.71	1 (10%)	6,12,14	1.59	1 (16%)
1	KCX	A	169	1,2	10,11,12	1.79	1 (10%)	6,12,14	1.13	0

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	KCX	B	169	1,2	-	0/9/10/12	-
1	KCX	A	169	1,2	-	0/9/10/12	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	169	KCX	CX-NZ	5.36	1.44	1.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	169	KCX	CX-NZ	5.02	1.44	1.35

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	169	KCX	CE-NZ-CX	3.36	127.69	121.98

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

## 5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 39 ligands modelled in this entry, 6 are monoatomic - leaving 33 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	EDO	A	25	-	3,3,3	0.51	0	2,2,2	0.19	0
4	EDO	B	16	-	3,3,3	0.45	0	2,2,2	1.03	0
4	EDO	B	7[B]	-	3,3,3	0.21	0	2,2,2	0.37	0
4	EDO	A	8	-	3,3,3	0.40	0	2,2,2	0.45	0
4	EDO	B	366	-	3,3,3	0.55	0	2,2,2	0.29	0
4	EDO	A	21	-	3,3,3	0.40	0	2,2,2	0.44	0
4	EDO	B	15	-	3,3,3	0.66	0	2,2,2	0.70	0
4	EDO	B	26	-	3,3,3	0.48	0	2,2,2	0.31	0
4	EDO	A	12	-	3,3,3	0.35	0	2,2,2	0.57	0
4	EDO	A	22	-	3,3,3	0.50	0	2,2,2	0.55	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
4	EDO	A	11	-	3,3,3	0.42	0	2,2,2	0.39	0
4	EDO	B	24	-	3,3,3	0.43	0	2,2,2	0.53	0
4	EDO	A	27	-	3,3,3	0.47	0	2,2,2	0.27	0
4	EDO	B	17	-	3,3,3	0.64	0	2,2,2	0.17	0
4	EDO	B	20	-	3,3,3	0.29	0	2,2,2	1.00	0
4	EDO	A	28	-	3,3,3	0.51	0	2,2,2	0.29	0
4	EDO	B	368	-	3,3,3	0.41	0	2,2,2	0.60	0
5	PEL	A	368[C]	-	9,9,9	0.65	0	10,10,10	0.89	0
4	EDO	A	19	-	3,3,3	0.40	0	2,2,2	0.64	0
4	EDO	A	10	-	3,3,3	0.40	0	2,2,2	0.49	0
5	PEL	A	368[A]	-	9,9,9	0.65	0	10,10,10	0.85	0
4	EDO	A	18	-	3,3,3	0.29	0	2,2,2	0.75	0
4	EDO	A	29	-	3,3,3	0.41	0	2,2,2	0.10	0
4	EDO	B	7[A]	2	3,3,3	0.22	0	2,2,2	0.61	0
4	EDO	A	13	-	3,3,3	0.46	0	2,2,2	0.25	0
4	EDO	B	367	-	3,3,3	0.48	0	2,2,2	0.64	0
4	EDO	B	9	-	3,3,3	0.40	0	2,2,2	0.53	0
5	PEL	A	367	-	9,9,9	1.41	0	10,10,10	0.98	1 (10%)
4	EDO	B	14	-	3,3,3	0.41	0	2,2,2	0.98	0
4	EDO	A	366	-	3,3,3	0.45	0	2,2,2	0.35	0
4	EDO	A	23	-	3,3,3	0.39	0	2,2,2	0.36	0
5	PEL	B	369	-	9,9,9	1.54	2 (22%)	10,10,10	0.83	0
5	PEL	A	368[B]	-	9,9,9	0.64	0	10,10,10	0.87	0

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	EDO	A	25	-	-	1/1/1/1	-
4	EDO	B	16	-	-	1/1/1/1	-
4	EDO	B	7[B]	-	-	0/1/1/1	-
4	EDO	A	8	-	-	0/1/1/1	-
4	EDO	B	366	-	-	1/1/1/1	-
4	EDO	A	21	-	-	1/1/1/1	-
4	EDO	B	15	-	-	0/1/1/1	-
4	EDO	B	26	-	-	1/1/1/1	-
4	EDO	A	12	-	-	1/1/1/1	-
4	EDO	A	22	-	-	1/1/1/1	-
4	EDO	A	11	-	-	1/1/1/1	-
4	EDO	B	24	-	-	0/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	EDO	A	27	-	-	1/1/1/1	-
4	EDO	B	17	-	-	1/1/1/1	-
4	EDO	B	20	-	-	1/1/1/1	-
4	EDO	A	28	-	-	1/1/1/1	-
4	EDO	B	368	-	-	1/1/1/1	-
5	PEL	A	368[C]	-	-	0/3/3/3	0/1/1/1
4	EDO	A	19	-	-	0/1/1/1	-
4	EDO	A	10	-	-	1/1/1/1	-
5	PEL	A	368[A]	-	-	1/3/3/3	0/1/1/1
4	EDO	A	18	-	-	1/1/1/1	-
4	EDO	A	29	-	-	0/1/1/1	-
4	EDO	B	7[A]	2	-	1/1/1/1	-
4	EDO	A	13	-	-	1/1/1/1	-
4	EDO	B	367	-	-	0/1/1/1	-
4	EDO	B	9	-	-	1/1/1/1	-
5	PEL	A	367	-	-	1/3/3/3	0/1/1/1
4	EDO	B	14	-	-	1/1/1/1	-
4	EDO	A	366	-	-	0/1/1/1	-
4	EDO	A	23	-	-	0/1/1/1	-
5	PEL	B	369	-	-	1/3/3/3	0/1/1/1
5	PEL	A	368[B]	-	-	1/3/3/3	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	369	PEL	C2'-C1'	2.12	1.43	1.38
5	B	369	PEL	C4'-C3'	2.05	1.42	1.38

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	367	PEL	C4'-C5'-C6'	-2.61	117.02	120.24

There are no chirality outliers.

5 of 23 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	367	PEL	OXT-C-CA-C1'
5	A	368[B]	PEL	OXT-C-CA-C1'
5	B	369	PEL	OXT-C-CA-C1'
4	A	12	EDO	O1-C1-C2-O2
4	A	21	EDO	O1-C1-C2-O2

There are no ring outliers.

16 monomers are involved in 28 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	25	EDO	1	0
4	B	366	EDO	1	0
4	B	15	EDO	2	0
4	A	22	EDO	1	0
4	A	11	EDO	1	0
4	B	24	EDO	1	0
4	A	27	EDO	1	0
4	B	17	EDO	3	0
4	B	20	EDO	2	0
4	A	28	EDO	3	0
4	A	10	EDO	1	0
4	A	29	EDO	1	0
4	B	7[A]	EDO	1	0
4	B	14	EDO	3	0
4	A	366	EDO	2	0
4	A	23	EDO	5	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.