



wwPDB X-ray Structure Validation Summary Report ⓘ

May 16, 2020 – 01:14 am BST

PDB ID : 2Y6I
Title : Crystal Structure of Collagenase G from Clostridium histolyticum in complex with Isoamylphosphonyl-Gly-Pro-Ala at 3.25 Angstrom Resolution
Authors : Eckhard, U.; Brandstetter, H.
Deposited on : 2011-01-21
Resolution : 3.25 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

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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 : 2.11
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) : 2.11

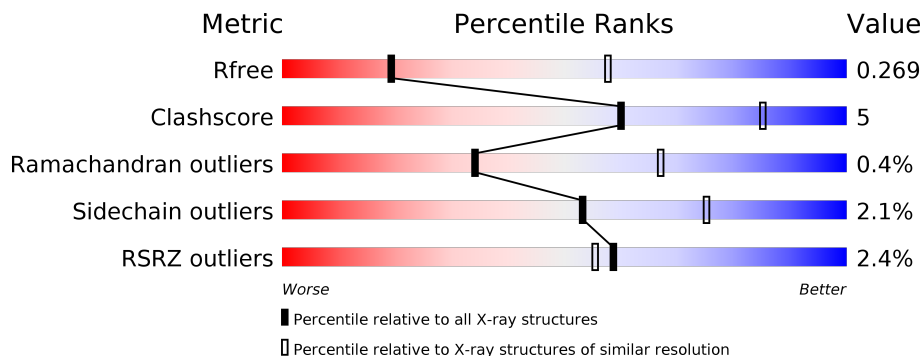
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.25 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	1191 (3.30-3.22)
Clashscore	141614	1251 (3.30-3.22)
Ramachandran outliers	138981	1229 (3.30-3.22)
Sidechain outliers	138945	1228 (3.30-3.22)
RSRZ outliers	127900	1154 (3.30-3.22)

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 ≥ 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	785	
2	B	4	

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
6	PEG	A	1798	-	-	-	X

2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 5378 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 COLLAGENASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	671	5241	3359	837	1032	13	0	0	0

There are 26 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	96	MET	-	expression tag	UNP Q9X721
A	97	GLY	-	expression tag	UNP Q9X721
A	98	SER	-	expression tag	UNP Q9X721
A	99	SER	-	expression tag	UNP Q9X721
A	100	HIS	-	expression tag	UNP Q9X721
A	101	HIS	-	expression tag	UNP Q9X721
A	102	HIS	-	expression tag	UNP Q9X721
A	103	HIS	-	expression tag	UNP Q9X721
A	104	HIS	-	expression tag	UNP Q9X721
A	105	HIS	-	expression tag	UNP Q9X721
A	106	SER	-	expression tag	UNP Q9X721
A	107	SER	-	expression tag	UNP Q9X721
A	108	GLY	-	expression tag	UNP Q9X721
A	109	GLU	-	expression tag	UNP Q9X721
A	110	ASN	-	expression tag	UNP Q9X721
A	111	LEU	-	expression tag	UNP Q9X721
A	112	TYR	-	expression tag	UNP Q9X721
A	113	PHE	-	expression tag	UNP Q9X721
A	114	GLN	-	expression tag	UNP Q9X721
A	115	GLY	-	expression tag	UNP Q9X721
A	116	GLY	-	expression tag	UNP Q9X721
A	117	THR	-	expression tag	UNP Q9X721
A	118	MET	-	expression tag	UNP Q9X721
A	575	LEU	SER	SEE REMARK 999	UNP Q9X721
A	665	VAL	ALA	SEE REMARK 999	UNP Q9X721
A	790	GLY	ALA	SEE REMARK 999	UNP Q9X721

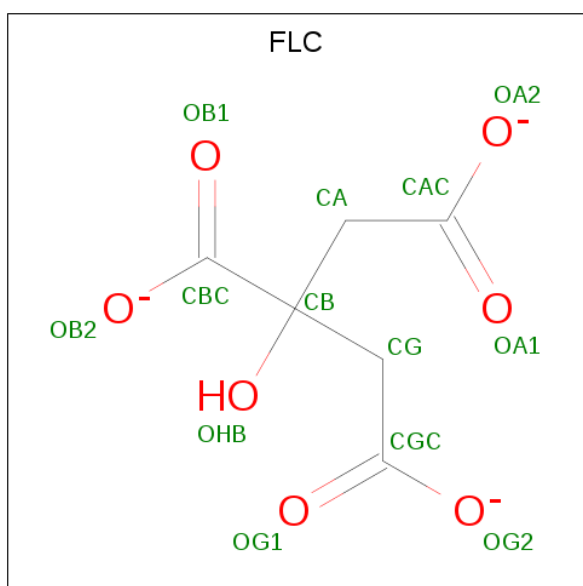
- Molecule 2 is a protein called ISOAMYLPHOSPHONYL-GLY-PRO-ALA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
2	B	4	25	15	3	6	1	0	0	0

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

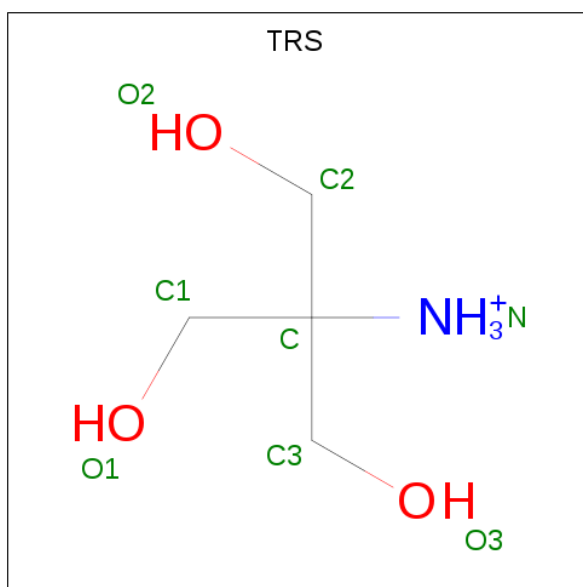
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Zn		
3	A	1	1	1	0	0

- Molecule 4 is CITRATE ANION (three-letter code: FLC) (formula: C₆H₅O₇).



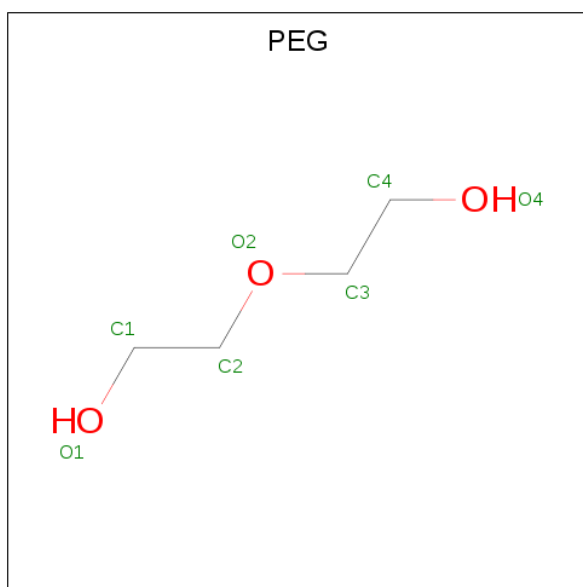
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
4	A	1	13	6	7	0	0

- Molecule 5 is 2-AMINO-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (three-letter code: TRS) (formula: C₄H₁₂NO₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
5	A	1	8	4	1	3	0	0
5	A	1	8	4	1	3	0	0
5	A	1	8	4	1	3	0	0

- Molecule 6 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: C₄H₁₀O₃).



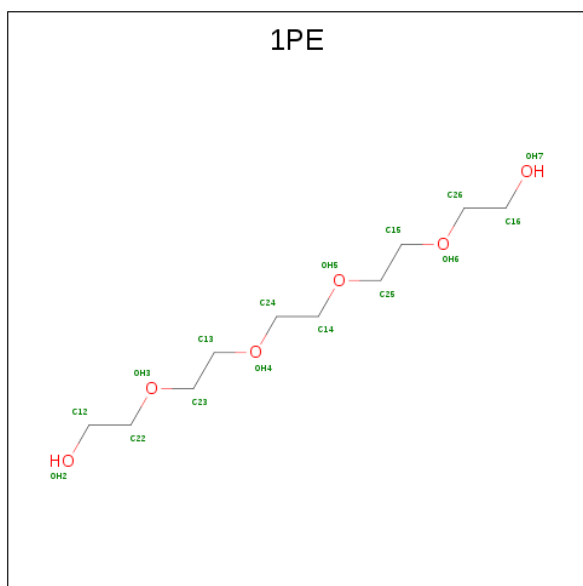
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
6	A	1	7	4	3	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf	
6	A	1	Total	C	O	0	0
			7	4	3		

- Molecule 7 is PENTAETHYLENE GLYCOL (three-letter code: 1PE) (formula: C₁₀H₂₂O₆).



Mol	Chain	Residues	Atoms		ZeroOcc	AltConf	
7	A	1	Total	C	O	0	0
			16	10	6		

- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	44	Total	O	0	0
			44	44		

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	58.12Å 108.84Å 181.03Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	93.28 – 3.25 34.80 – 3.25	Depositor EDS
% Data completeness (in resolution range)	99.1 (93.28-3.25) 99.2 (34.80-3.25)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.18 (at 3.25Å)	Xtrriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.216 , 0.266 0.220 , 0.269	Depositor DCC
R_{free} test set	958 reflections (5.15%)	wwPDB-VP
Wilson B-factor (Å ²)	73.3	Xtrriage
Anisotropy	0.134	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 57.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	5378	wwPDB-VP
Average B, all atoms (Å ²)	76.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.61% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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: ZN, IPI, 1PE, TRS, PEG, FLC

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	0.34	0/5365	0.47	0/7293
2	B	1.39	1/17 (5.9%)	0.98	0/21
All	All	0.35	1/5382 (0.0%)	0.47	0/7314

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
2	B	0	2

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	4	ALA	C-OXT	5.30	1.33	1.23

There are no bond angle outliers.

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	B	2	GLY	Peptide
2	B	3	PRO	Peptide

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	5241	0	4785	47	0
2	B	25	0	26	1	0
3	A	1	0	0	0	0
4	A	13	0	5	3	0
5	A	24	0	36	2	0
6	A	14	0	20	0	0
7	A	16	0	22	0	0
8	A	44	0	0	1	0
All	All	5378	0	4894	47	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 47 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:480:LYS:HA	1:A:490:THR:HG21	1.47	0.95
1:A:508:ARG:HD2	1:A:515:PHE:O	1.87	0.74
1:A:508:ARG:HD3	1:A:513:SER:HB3	1.69	0.73
1:A:586:ASP:O	1:A:588:ARG:N	2.23	0.70
1:A:736:TRP:H3	4:A:1793:FLC:HG2	1.56	0.69

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	667/785 (85%)	639 (96%)	26 (4%)	2 (0%)	41 72
2	B	1/4 (25%)	0	0	1 (100%)	0 0

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	668/789 (85%)	639 (96%)	26 (4%)	3 (0%)	34 67

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	3	PRO
1	A	234	GLY
1	A	587	HIS

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	517/672 (77%)	506 (98%)	11 (2%)	53 75
2	B	1/1 (100%)	1 (100%)	0	100 100
All	All	518/673 (77%)	507 (98%)	11 (2%)	53 75

5 of 11 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	606	PHE
1	A	637	VAL
1	A	728	THR
1	A	590	SER
1	A	710	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	463	ASN
1	A	587	HIS
1	A	767	ASN
1	A	777	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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

Of 8 ligands modelled in this entry, 1 is monoatomic - leaving 7 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	TRS	A	1795	-	7,7,7	0.37	0	9,9,9	0.69	0
5	TRS	A	1794	-	7,7,7	0.33	0	9,9,9	0.54	0
6	PEG	A	1798	-	6,6,6	0.44	0	5,5,5	0.33	0
4	FLC	A	1793	-	3,12,12	1.09	0	3,17,17	2.27	2 (66%)
6	PEG	A	1797	-	6,6,6	0.46	0	5,5,5	0.29	0
5	TRS	A	1796	-	7,7,7	0.37	0	9,9,9	0.53	0
7	1PE	A	1799	-	15,15,15	0.50	0	14,14,14	0.24	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
5	TRS	A	1795	-	-	6/9/9/9	-
5	TRS	A	1794	-	-	3/9/9/9	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	PEG	A	1798	-	-	2/4/4/4	-
4	FLC	A	1793	-	-	4/6/16/16	-
6	PEG	A	1797	-	-	4/4/4/4	-
5	TRS	A	1796	-	-	2/9/9/9	-
7	1PE	A	1799	-	-	9/13/13/13	-

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	1793	FLC	CB-CA-CAC	-2.66	110.73	114.98
4	A	1793	FLC	CB-CG-CGC	-2.65	110.74	114.98

There are no chirality outliers.

5 of 30 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	1795	TRS	C2-C-C1-O1
5	A	1795	TRS	C3-C-C1-O1
5	A	1795	TRS	N-C-C1-O1
5	A	1795	TRS	C1-C-C3-O3
5	A	1795	TRS	C2-C-C3-O3

There are no ring outliers.

2 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	1795	TRS	2	0
4	A	1793	FLC	3	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, 95th 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 ²)	Q<0.9
1	A	671/785 (85%)	0.06	16 (2%) 59 55	40, 73, 113, 181	0
2	B	3/4 (75%)	0.90	0 100 100	84, 84, 89, 91	0
All	All	674/789 (85%)	0.06	16 (2%) 59 55	40, 74, 113, 181	0

The worst 5 of 16 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	117	THR	4.5
1	A	308	THR	4.4
1	A	119	TYR	3.8
1	A	587	HIS	3.7
1	A	149	ASN	3.7

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](#)

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, 95th 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(\AA^2)	Q<0.9
6	PEG	A	1798	7/7	0.73	0.43	98,98,98,99	0
5	TRS	A	1795	8/8	0.76	0.36	80,81,81,81	0
5	TRS	A	1796	8/8	0.79	0.31	79,79,79,79	0
7	1PE	A	1799	16/16	0.83	0.29	79,80,81,81	0
5	TRS	A	1794	8/8	0.86	0.33	79,80,80,81	0
6	PEG	A	1797	7/7	0.86	0.37	92,92,92,93	0
4	FLC	A	1793	13/13	0.92	0.20	59,60,62,62	0
3	ZN	A	1791	1/1	0.99	0.06	55,55,55,55	0

6.5 Other polymers [i](#)

There are no such residues in this entry.