



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 25, 2024 – 12:07 AM EDT

PDB ID : 6GQ3  
Title : Human asparagine synthetase (ASNS) in complex with 6-diazo-5-oxo-L-norleucine (DON) at 1.85 Å resolution  
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Deposited on : 2018-06-07  
Resolution : 1.85 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)  
Xtrriage (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

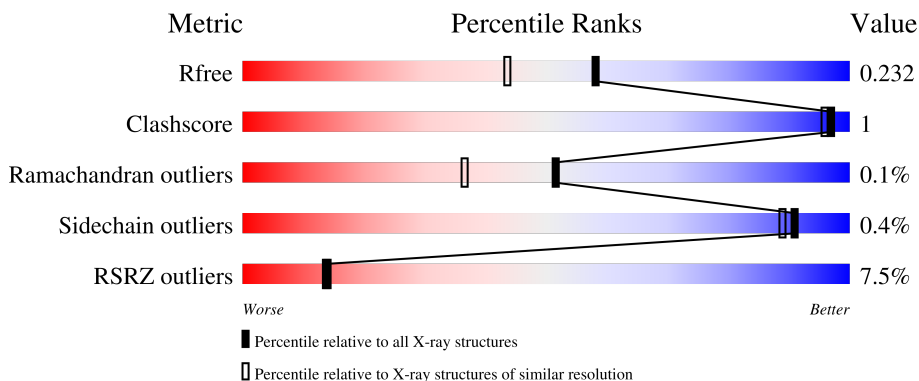
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.85 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	2469 (1.86-1.86)
Clashscore	141614	2625 (1.86-1.86)
Ramachandran outliers	138981	2592 (1.86-1.86)
Sidechain outliers	138945	2592 (1.86-1.86)
RSRZ outliers	127900	2436 (1.86-1.86)

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	561	
1	B	561	

## 2 Entry composition [i](#)

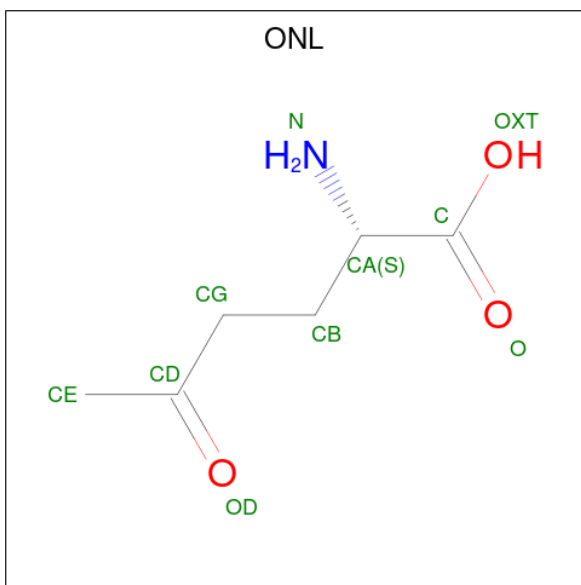
There are 6 unique types of molecules in this entry. The entry contains 8899 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Asparagine synthetase [glutamine-hydrolyzing].

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	509	Total 4135	C 2666	N 695	O 751	S 23	0	3	0
1	B	509	Total 4128	C 2661	N 694	O 750	S 23	0	2	0

- Molecule 2 is 5-OXO-L-NORLEUCINE (three-letter code: ONL) (formula: C<sub>6</sub>H<sub>11</sub>NO<sub>3</sub>).



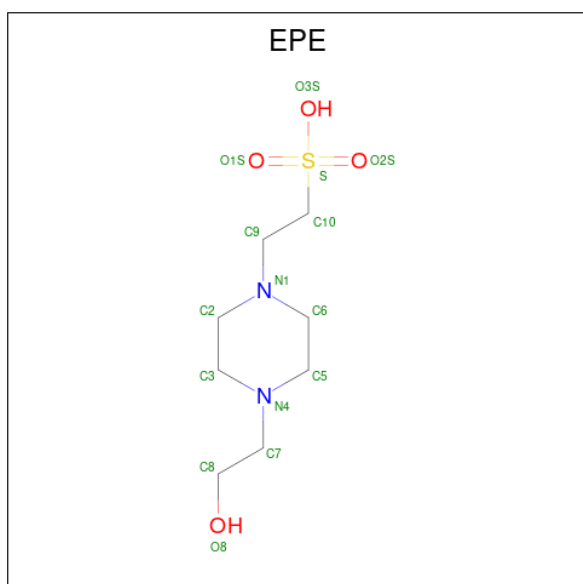
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	A	1	Total 10	C 6	N 1	O 3	0	0
2	B	1	Total 10	C 6	N 1	O 3	0	0

- Molecule 3 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
3	A	1	Total C O 4 2 2	0	0
3	A	1	Total C O 4 2 2	0	0
3	A	1	Total C O 4 2 2	0	0
3	B	1	Total C O 4 2 2	0	0

- Molecule 4 is 4-(2-HYDROXYETHYL)-1-PIPERAZINE ETHANESULFONIC ACID (three-letter code: EPE) (formula: C<sub>8</sub>H<sub>18</sub>N<sub>2</sub>O<sub>4</sub>S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	S	0	0
			15	8	2	4	1		
4	B	1	Total	C	N	O	S	0	0
			15	8	2	4	1		

- Molecule 5 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total	Cl	0	0
			1	1		
5	B	1	Total	Cl	0	0
			1	1		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	301	Total	O	0	0
			301	301		
6	B	267	Total	O	0	0
			267	267		



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	64.70Å 83.52Å 110.29Å 90.00° 90.65° 90.00°	Depositor
Resolution (Å)	33.65 – 1.85 33.65 – 1.85	Depositor EDS
% Data completeness (in resolution range)	99.8 (33.65-1.85) 99.8 (33.65-1.85)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.68 (at 1.85Å)	Xtrriage
Refinement program	REFMAC 5.8.0189	Depositor
R, $R_{free}$	0.178 , 0.225 0.187 , 0.232	Depositor DCC
$R_{free}$ test set	4876 reflections (4.88%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	22.1	Xtrriage
Anisotropy	0.429	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 46.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.119 for h,-k,-l	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	8899	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	34.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.30% 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: EPE, CL, EDO, ONL

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	0.54	0/4245	0.70	0/5738
1	B	0.51	0/4238	0.68	1/5728 (0.0%)
All	All	0.52	0/8483	0.69	1/11466 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	245	ARG	NE-CZ-NH1	5.05	122.82	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	4135	0	4080	6	0
1	B	4128	0	4072	8	0
2	A	10	0	8	0	0
2	B	10	0	8	0	0
3	A	12	0	18	0	0
3	B	4	0	6	0	0
4	A	15	0	18	0	0
4	B	15	0	18	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	1	0	0	0	0
5	B	1	0	0	0	0
6	A	301	0	0	1	0
6	B	267	0	0	0	0
All	All	8899	0	8228	14	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 1.

All (14) 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:316:SER:HB2	1:B:483:ILE:HG21	1.69	0.75
1:B:148:MET:HE2	1:B:154:LEU:HD13	1.79	0.64
1:B:148:MET:CE	1:B:154:LEU:HD13	2.31	0.61
1:B:9:SER:HB3	1:B:12:CYS:HB3	1.94	0.49
1:B:12:CYS:O	1:B:12:CYS:SG	2.71	0.48
1:A:423:ARG:NE	6:A:702:HOH:O	2.46	0.48
1:A:31:PHE:CD1	1:A:47:HIS:CE1	3.03	0.47
1:B:6:LEU:HD12	1:B:12:CYS:HB2	1.98	0.46
1:B:59:GLN:HA	1:B:60:PRO:C	2.37	0.45
1:A:123[B]:VAL:HG21	1:A:156:VAL:HG21	1.98	0.44
1:A:59:GLN:HA	1:A:60:PRO:C	2.38	0.43
1:B:131:LYS:NZ	1:B:188:ASP:OD1	2.52	0.42
1:A:2:GLY:HA3	1:A:23:ILE:HD12	2.03	0.41
1:A:312:VAL:HG21	1:A:347:ILE:CD1	2.51	0.41

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	506/561 (90%)	496 (98%)	10 (2%)	0	100	100
1	B	505/561 (90%)	488 (97%)	16 (3%)	1 (0%)	47	33
All	All	1011/1122 (90%)	984 (97%)	26 (3%)	1 (0%)	51	36

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	13	LEU

### 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	448/490 (91%)	447 (100%)	1 (0%)	93	92
1	B	447/490 (91%)	444 (99%)	3 (1%)	84	79
All	All	895/980 (91%)	891 (100%)	4 (0%)	91	89

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	12	CYS
1	B	12	CYS
1	B	17	CYS
1	B	417	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	129	ASN
1	A	440	ASN

### 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 10 ligands modelled in this entry, 2 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
4	EPE	B	603	-	15,15,15	1.97	1 (6%)	18,20,20	1.18	1 (5%)
3	EDO	A	604	-	3,3,3	0.47	0	2,2,2	0.33	0
3	EDO	A	602	-	3,3,3	0.49	0	2,2,2	0.27	0
2	ONL	A	601	1	8,9,9	0.65	0	10,11,11	1.75	1 (10%)
3	EDO	B	602	-	3,3,3	0.50	0	2,2,2	0.16	0
4	EPE	A	605	-	15,15,15	1.95	1 (6%)	18,20,20	1.34	2 (11%)
2	ONL	B	601	1	8,9,9	0.74	0	10,11,11	1.68	1 (10%)
3	EDO	A	603	-	3,3,3	0.36	0	2,2,2	0.50	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	EPE	B	603	-	-	2/9/19/19	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	EDO	A	604	-	-	1/1/1/1	-
3	EDO	A	602	-	-	0/1/1/1	-
2	ONL	A	601	1	-	2/9/9/9	-
3	EDO	B	602	-	-	0/1/1/1	-
4	EPE	A	605	-	-	5/9/19/19	0/1/1/1
2	ONL	B	601	1	-	2/9/9/9	-
3	EDO	A	603	-	-	0/1/1/1	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	603	EPE	C10-S	-7.26	1.67	1.77
4	A	605	EPE	C10-S	-7.03	1.67	1.77

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	601	ONL	CB-CG-CD	-4.78	109.66	114.57
2	A	601	ONL	CB-CG-CD	-4.35	110.10	114.57
4	A	605	EPE	O1S-S-C10	3.97	111.70	106.92
4	B	603	EPE	O1S-S-C10	3.16	110.72	106.92
4	A	605	EPE	O3S-S-C10	2.59	109.96	105.77

There are no chirality outliers.

All (12) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	601	ONL	CE-CD-CG-CB
2	A	601	ONL	CE-CD-CG-CB
4	A	605	EPE	C9-C10-S-O3S
2	B	601	ONL	OD-CD-CG-CB
2	A	601	ONL	OD-CD-CG-CB
4	A	605	EPE	C9-C10-S-O1S
4	B	603	EPE	C9-C10-S-O2S
4	A	605	EPE	C10-C9-N1-C2
3	A	604	EDO	O1-C1-C2-O2
4	B	603	EPE	C9-C10-S-O3S
4	A	605	EPE	C9-C10-S-O2S
4	A	605	EPE	C10-C9-N1-C6

There are no ring outliers.

No monomer is involved in short contacts.

## 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	509/561 (90%)	0.12	31 (6%) 21 20	12, 22, 74, 133	0
1	B	509/561 (90%)	0.35	45 (8%) 10 9	14, 30, 91, 138	1 (0%)
All	All	1018/1122 (90%)	0.24	76 (7%) 14 14	12, 26, 86, 138	1 (0%)

All (76) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	440	ASN	7.6
1	A	291	ASP	6.5
1	B	169	SER	5.9
1	B	292	SER	5.5
1	A	170	ALA	5.4
1	A	481	PHE	5.3
1	B	380	PRO	5.3
1	B	481	PHE	5.2
1	A	439	LYS	5.1
1	B	383	GLU	4.9
1	B	379	ALA	4.8
1	B	291	ASP	4.8
1	A	12	CYS	4.4
1	B	490	HIS	4.4
1	B	12	CYS	4.2
1	B	209	VAL	4.2
1	B	290	GLU	4.0
1	B	382	PRO	3.9
1	B	13	LEU	3.8
1	B	439	LYS	3.7
1	A	378	LYS	3.7
1	A	440	ASN	3.7
1	A	380	PRO	3.6
1	A	169	SER	3.5

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Mol	Chain	Res	Type	RSRZ
1	A	490	HIS	3.4
1	B	381	SER	3.3
1	B	170	ALA	3.3
1	B	378	LYS	3.2
1	B	487	TYR	3.2
1	A	290	GLU	3.2
1	A	382	PRO	3.1
1	A	11	ASP	3.0
1	A	381	SER	3.0
1	B	485	GLN	3.0
1	B	296	LEU	2.9
1	A	482	LYS	2.8
1	A	10	ASP	2.7
1	B	479	SER	2.7
1	A	383	GLU	2.6
1	A	485	GLN	2.6
1	B	289	MET	2.6
1	A	479	SER	2.5
1	B	384	LYS	2.5
1	A	172	PRO	2.5
1	B	207	ARG	2.5
1	A	13	LEU	2.5
1	A	15	VAL	2.5
1	A	379	ALA	2.4
1	B	16	GLN	2.4
1	B	437	ILE	2.4
1	B	314	PHE	2.4
1	B	313	LEU	2.3
1	B	375	TYR	2.3
1	B	374	ILE	2.3
1	B	317	GLU	2.3
1	B	10	ASP	2.3
1	A	17	CYS	2.2
1	B	208	ASP	2.2
1	B	172	PRO	2.2
1	A	314	PHE	2.2
1	B	3	ILE	2.2
1	A	14	SER	2.2
1	A	72[A]	CYS	2.2
1	B	141	VAL	2.1
1	B	11	ASP	2.1
1	A	534	HIS	2.1

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Mol	Chain	Res	Type	RSRZ
1	B	167	LYS	2.1
1	B	316	SER	2.1
1	A	401	VAL	2.1
1	B	482	LYS	2.1
1	A	454	SER	2.0
1	B	377	HIS	2.0
1	B	14	SER	2.0
1	B	15	VAL	2.0
1	B	402	LEU	2.0
1	A	486	GLU	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 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	EPE	A	605	15/15	0.91	0.14	25,35,71,200	0
4	EPE	B	603	15/15	0.92	0.14	28,41,103,105	0
3	EDO	A	604	4/4	0.93	0.14	28,33,75,88	0
3	EDO	B	602	4/4	0.95	0.10	23,30,31,33	0
3	EDO	A	603	4/4	0.95	0.14	25,28,37,39	0
2	ONL	B	601	10/10	0.95	0.15	15,19,25,32	0
3	EDO	A	602	4/4	0.96	0.12	25,28,33,34	0
2	ONL	A	601	10/10	0.97	0.14	10,12,18,25	0
5	CL	A	606	1/1	1.00	0.12	13,13,13,13	0
5	CL	B	604	1/1	1.00	0.11	18,18,18,18	0



## 6.5 Other polymers [i](#)

There are no such residues in this entry.