



wwPDB X-ray Structure Validation Summary Report ⓘ

Sep 5, 2016 – 01:53 PM EDT

PDB ID : 5I0H
Title : Crystal structure of myosin X motor domain in pre-powerstroke state
Authors : Isabet, T.; Blanc, F.; Sweeney, H.L.; Houdusse, A.
Deposited on : 2016-02-04
Resolution : 1.80 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

<http://wwpdb.org/validation/2016/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 : 1.7.1 (RC1), CSD as537be (2016)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20027939
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) : rb-20027939

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
5	EDO	B	804	-	-	-	X
5	EDO	B	805	-	-	X	X
5	EDO	B	806	-	-	-	X
5	EDO	B	808	-	-	-	X
5	EDO	B	809	-	-	-	X
5	EDO	B	816	-	-	-	X

2 Entry composition [i](#)

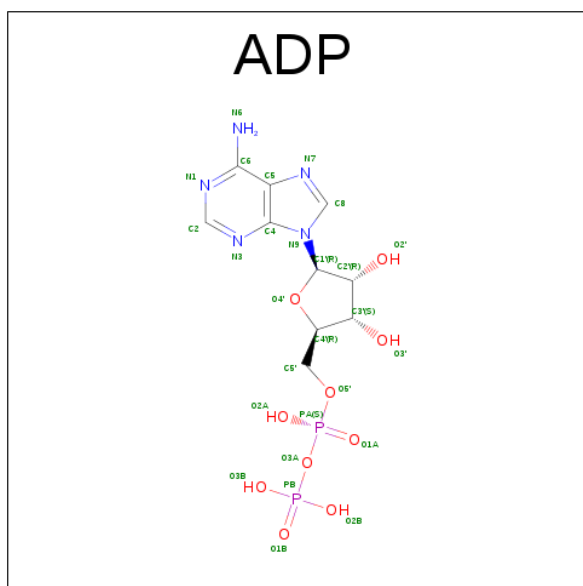
There are 7 unique types of molecules in this entry. The entry contains 13273 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Unconventional myosin-X.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	731	Total	C	N	O	S	0	13	0
			5954	3767	1029	1131	27			
1	B	723	Total	C	N	O	S	0	17	0
			5900	3730	1028	1115	27			

- Molecule 2 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$).

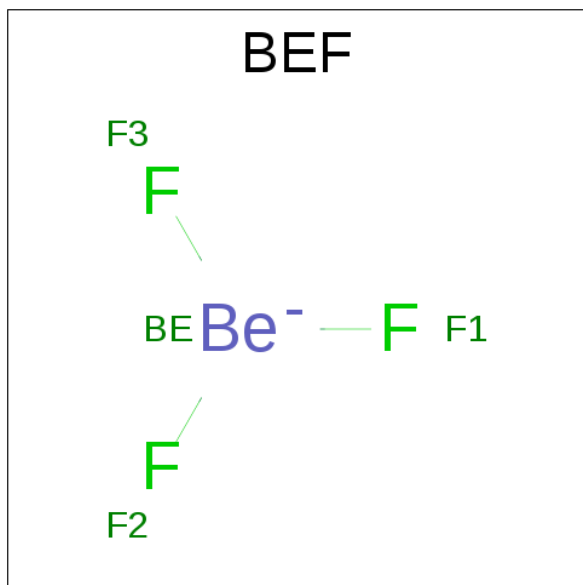


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
2	B	1	Total	C	N	O	P	0	0
			27	10	5	10	2		

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

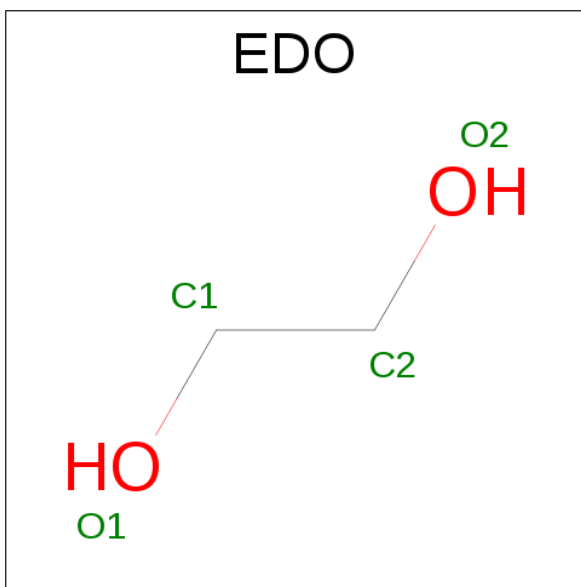
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	1	Total	Mg	0	0
			1	1		
3	A	1	Total	Mg	0	0
			1	1		

- Molecule 4 is BERYLLIUM TRIFLUORIDE ION (three-letter code: BEF) (formula: BeF₃).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	Be	F	0	0
			4	1	3		
4	B	1	Total	Be	F	0	0
			4	1	3		

- Molecule 5 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C₂H₆O₂).



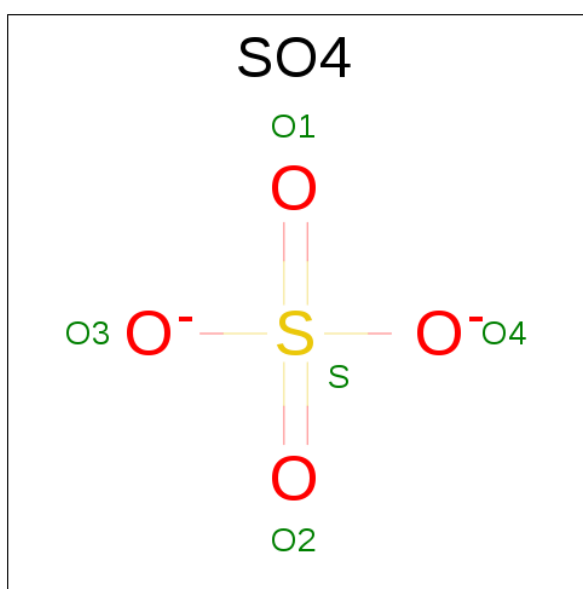
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			4	2	2		
5	A	1	Total	C	O	0	0
			4	2	2		
5	A	1	Total	C	O	0	0
			4	2	2		
5	A	1	Total	C	O	0	0
			4	2	2		
5	A	1	Total	C	O	0	0
			4	2	2		
5	A	1	Total	C	O	0	0
			4	2	2		
5	B	1	Total	C	O	0	0
			4	2	2		
5	B	1	Total	C	O	0	0
			4	2	2		
5	B	1	Total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

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

- Molecule 6 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	O	S	0	0
			5	4	1		
6	B	1	Total	O	S	0	0
			5	4	1		
6	B	1	Total	O	S	0	0
			5	4	1		
6	B	1	Total	O	S	0	0
			5	4	1		
6	B	1	Total	O	S	0	0
			5	4	1		

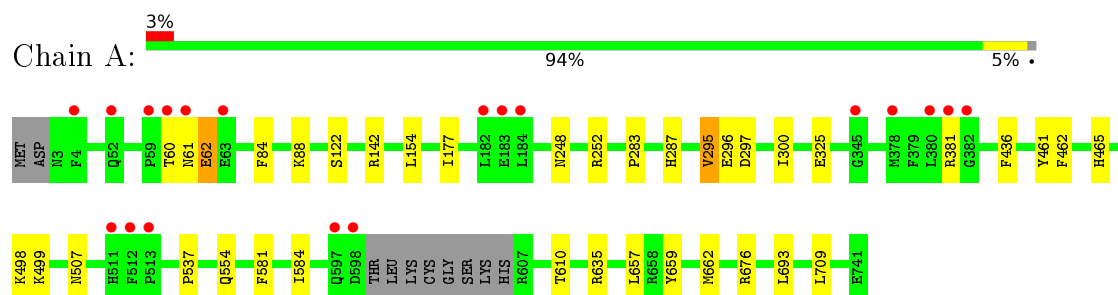
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	648	Total 648	O 648	0	0
7	B	610	Total 610	O 610	0	1

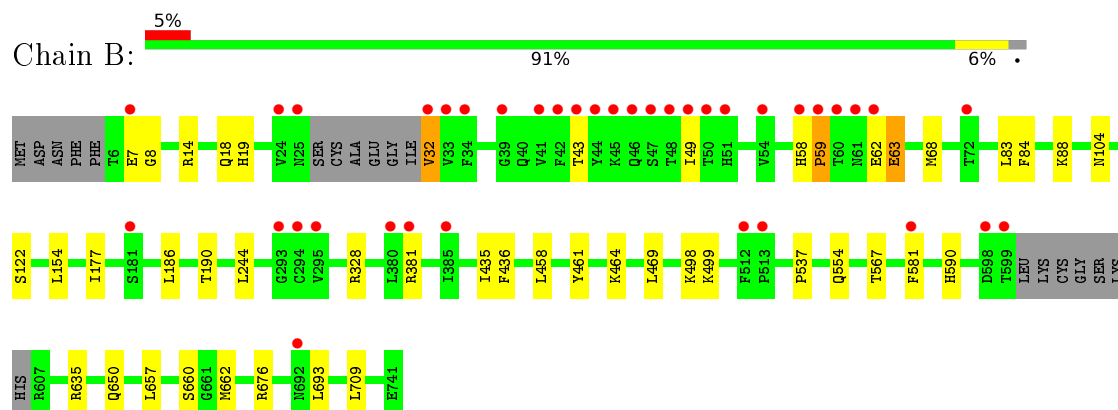
3 Residue-property plots [i](#)

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: Unconventional myosin-X



• Molecule 1: Unconventional myosin-X



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	76.48Å 78.30Å 78.67Å 75.69° 86.38° 76.12°	Depositor
Resolution (Å)	26.35 – 1.80 47.63 – 1.80	Depositor EDS
% Data completeness (in resolution range)	97.5 (26.35-1.80) 90.3 (47.63-1.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.55 (at 1.79Å)	Xtriage
Refinement program	BUSTER 2.10.2	Depositor
R, R_{free}	0.165 , 0.190 0.168 , 0.195	Depositor DCC
R_{free} test set	7758 reflections (5.26%)	DCC
Wilson B-factor (Å ²)	27.0	Xtriage
Anisotropy	0.100	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 49.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.015 for -l,-k,-h	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	13273	wwPDB-VP
Average B, all atoms (Å ²)	37.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.96% 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: MG, BEF, EDO, ADP, SO4

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	0.52	0/6076	0.62	1/8212 (0.0%)
1	B	0.50	0/6016	0.61	0/8128
All	All	0.51	0/12092	0.62	1/16340 (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	A	61	ASN	C-N-CA	6.11	136.99	121.70

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	5954	0	5724	17	0
1	B	5900	0	5694	24	0
2	A	27	0	12	0	0
2	B	27	0	12	3	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	4	0	0	0	0
4	B	4	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	32	0	48	0	0
5	B	40	0	60	7	0
6	A	5	0	0	0	0
6	B	20	0	0	0	0
7	A	648	0	0	2	0
7	B	610	0	0	3	0
All	All	13273	0	11550	45	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 2.

The worst 5 of 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)
2:B:801:ADP:HN61	5:B:805:EDO:H22	1.41	0.85
1:B:590:HIS:HD2	7:B:1411:HOH:O	1.63	0.81
1:B:104:ASN:HA	5:B:805:EDO:H11	1.69	0.74
1:A:581:PHE:CD2	1:A:584:ILE:HG12	2.25	0.71
2:B:801:ADP:N6	5:B:805:EDO:H22	2.07	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	740/741 (100%)	719 (97%)	18 (2%)	3 (0%)	39	23
1	B	734/741 (99%)	708 (96%)	23 (3%)	3 (0%)	39	23
All	All	1474/1482 (100%)	1427 (97%)	41 (3%)	6 (0%)	39	23

5 of 6 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	59	PRO
1	A	381	ARG
1	B	63	GLU
1	B	381	ARG
1	A	62	GLU

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	640/662 (97%)	633 (99%)	7 (1%)	80	74
1	B	634/662 (96%)	630 (99%)	4 (1%)	90	88
All	All	1274/1324 (96%)	1263 (99%)	11 (1%)	84	80

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

Mol	Chain	Res	Type
1	A	436	PHE
1	A	659	TYR
1	B	43	THR
1	A	296	GLU
1	B	32	VAL

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 19 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	18	GLN
1	B	40	GLN
1	B	465	HIS
1	A	554	GLN
1	B	554	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

5.6 Ligand geometry ⓘ

Of 29 ligands modelled in this entry, 2 are monoatomic - leaving 27 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	$\# Z > 2$
2	ADP	A	801	3,4	24,29,29	0.84	0	23,45,45	0.59	0
4	BEF	A	803	2	0,3,3	0.00	-	0,3,3	0.00	-
5	EDO	A	804	-	3,3,3	0.51	0	2,2,2	0.43	0
5	EDO	A	805	-	3,3,3	0.69	0	2,2,2	0.10	0
5	EDO	A	806	-	3,3,3	0.53	0	2,2,2	0.53	0
5	EDO	A	807	-	3,3,3	0.54	0	2,2,2	0.40	0
5	EDO	A	808	-	3,3,3	0.56	0	2,2,2	0.35	0
6	SO4	A	809	-	4,4,4	0.82	0	6,6,6	0.19	0
5	EDO	A	810	-	3,3,3	0.48	0	2,2,2	0.52	0
5	EDO	A	811	-	3,3,3	0.61	0	2,2,2	0.20	0
5	EDO	A	812	-	3,3,3	0.44	0	2,2,2	0.66	0
2	ADP	B	801	3,4	24,29,29	0.80	1 (4%)	23,45,45	0.62	0
4	BEF	B	803	2	0,3,3	0.00	-	0,3,3	0.00	-
5	EDO	B	804	-	3,3,3	0.49	0	2,2,2	1.15	0
5	EDO	B	805	-	3,3,3	0.42	0	2,2,2	0.38	0
5	EDO	B	806	-	3,3,3	0.55	0	2,2,2	0.42	0
5	EDO	B	807	-	3,3,3	0.59	0	2,2,2	0.02	0
5	EDO	B	808	-	3,3,3	0.42	0	2,2,2	0.69	0
5	EDO	B	809	-	3,3,3	0.58	0	2,2,2	0.72	0
5	EDO	B	810	-	3,3,3	0.74	0	2,2,2	0.14	0
6	SO4	B	811	-	4,4,4	0.29	0	6,6,6	0.33	0
6	SO4	B	812	-	4,4,4	0.23	0	6,6,6	0.14	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
6	SO4	B	813	-	4,4,4	0.08	0	6,6,6	0.14	0
6	SO4	B	814	-	4,4,4	0.21	0	6,6,6	0.06	0
5	EDO	B	815	-	3,3,3	0.53	0	2,2,2	0.48	0
5	EDO	B	816	-	3,3,3	0.44	0	2,2,2	0.31	0
5	EDO	B	817	-	3,3,3	0.42	0	2,2,2	0.55	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
2	ADP	A	801	3,4	-	0/12/32/32	0/3/3/3
4	BEF	A	803	2	-	0/0/0/0	0/0/0/0
5	EDO	A	804	-	-	0/1/1/1	0/0/0/0
5	EDO	A	805	-	-	0/1/1/1	0/0/0/0
5	EDO	A	806	-	-	0/1/1/1	0/0/0/0
5	EDO	A	807	-	-	0/1/1/1	0/0/0/0
5	EDO	A	808	-	-	0/1/1/1	0/0/0/0
6	SO4	A	809	-	-	0/0/0/0	0/0/0/0
5	EDO	A	810	-	-	0/1/1/1	0/0/0/0
5	EDO	A	811	-	-	0/1/1/1	0/0/0/0
5	EDO	A	812	-	-	0/1/1/1	0/0/0/0
2	ADP	B	801	3,4	-	0/12/32/32	0/3/3/3
4	BEF	B	803	2	-	0/0/0/0	0/0/0/0
5	EDO	B	804	-	-	0/1/1/1	0/0/0/0
5	EDO	B	805	-	-	0/1/1/1	0/0/0/0
5	EDO	B	806	-	-	0/1/1/1	0/0/0/0
5	EDO	B	807	-	-	0/1/1/1	0/0/0/0
5	EDO	B	808	-	-	0/1/1/1	0/0/0/0
5	EDO	B	809	-	-	0/1/1/1	0/0/0/0
5	EDO	B	810	-	-	0/1/1/1	0/0/0/0
6	SO4	B	811	-	-	0/0/0/0	0/0/0/0
6	SO4	B	812	-	-	0/0/0/0	0/0/0/0
6	SO4	B	813	-	-	0/0/0/0	0/0/0/0
6	SO4	B	814	-	-	0/0/0/0	0/0/0/0
5	EDO	B	815	-	-	0/1/1/1	0/0/0/0
5	EDO	B	816	-	-	0/1/1/1	0/0/0/0
5	EDO	B	817	-	-	0/1/1/1	0/0/0/0

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	801	ADP	PB-O3B	-2.24	1.47	1.54

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

3 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	801	ADP	3	0
5	B	805	EDO	5	0
5	B	809	EDO	2	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	731/741 (98%)	-0.23	19 (2%) 59 54	18, 31, 59, 100	1 (0%)
1	B	723/741 (97%)	-0.12	38 (5%) 30 25	20, 33, 73, 156	8 (1%)
All	All	1454/1482 (98%)	-0.17	57 (3%) 43 37	18, 32, 65, 156	9 (0%)

The worst 5 of 57 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	49	ILE	10.9
1	B	33	VAL	10.4
1	B	43	THR	5.5
1	B	61	ASN	5.4
1	A	381	ARG	5.4

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors(\AA^2)	Q<0.9
5	EDO	B	806	4/4	0.30	0.52	10.66	93,94,95,95	0
5	EDO	B	809	4/4	0.83	0.19	6.16	35,36,41,41	0
5	EDO	B	816	4/4	0.92	0.36	5.81	48,48,48,49	0
5	EDO	B	808	4/4	0.97	0.13	4.46	28,29,33,34	0
5	EDO	B	804	4/4	0.93	0.16	4.09	32,33,36,40	0
5	EDO	B	805	4/4	0.95	0.17	3.56	30,32,37,39	0
5	EDO	B	807	4/4	0.83	0.30	1.98	44,46,49,50	0
6	SO4	A	809	5/5	0.98	0.12	1.28	48,52,53,56	0
5	EDO	B	815	4/4	0.89	0.14	0.73	39,41,43,48	0
5	EDO	A	805	4/4	0.93	0.12	0.65	25,31,31,33	0
4	BEF	A	803	4/4	0.98	0.12	0.33	18,20,20,21	0
2	ADP	A	801	27/27	0.99	0.11	0.30	17,18,20,22	0
4	BEF	B	803	4/4	0.99	0.11	0.08	19,21,22,22	0
3	MG	B	802	1/1	0.99	0.10	-0.31	21,21,21,21	0
2	ADP	B	801	27/27	0.98	0.07	-0.48	19,24,31,32	0
3	MG	A	802	1/1	0.99	0.10	-0.76	20,20,20,20	0
5	EDO	B	810	4/4	0.97	0.08	-0.86	28,36,37,39	0
6	SO4	B	811	5/5	0.96	0.06	-0.93	42,44,49,53	0
5	EDO	A	812	4/4	0.98	0.07	-1.00	28,29,29,30	0
6	SO4	B	814	5/5	0.81	0.29	-	150,150,150,150	0
6	SO4	B	813	5/5	0.88	0.16	-	87,88,90,90	0
5	EDO	A	807	4/4	0.78	0.19	-	67,68,70,70	0
5	EDO	A	804	4/4	0.82	0.20	-	67,67,67,67	0
6	SO4	B	812	5/5	0.97	0.17	-	82,82,83,83	0
5	EDO	A	810	4/4	0.95	0.08	-	33,34,36,41	0
5	EDO	A	806	4/4	0.79	0.31	-	68,69,70,70	0
5	EDO	B	817	4/4	0.93	0.10	-	46,48,50,54	0
5	EDO	A	811	4/4	0.75	0.28	-	53,55,57,59	0
5	EDO	A	808	4/4	0.27	0.40	-	85,86,87,89	0

6.5 Other polymers [i](#)

There are no such residues in this entry.