



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 1, 2016 – 03:03 PM GMT

PDB ID : 4BE2  
Title : PFV intasome with inhibitor XZ-259  
Authors : Hare, S.; Cherepanov, P.  
Deposited on : 2012-10-08  
Resolution : 2.38 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  
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>  
with specific help available everywhere you see the ⓘ symbol.

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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 : 1.7 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20026688  
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) : trunk26865

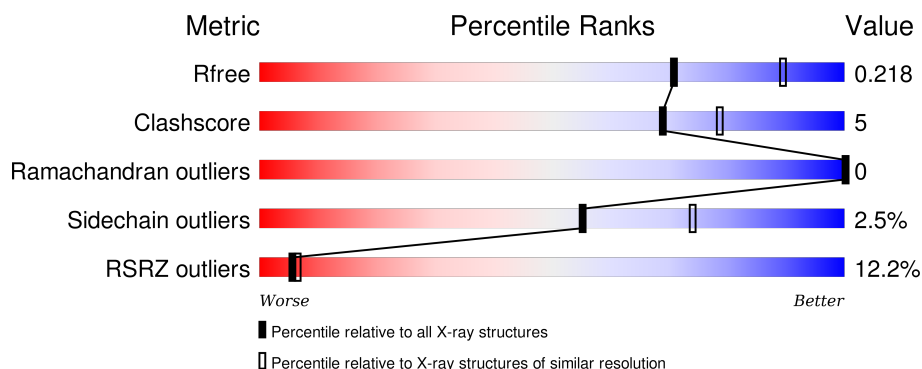
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.38 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))
$R_{free}$	91344	4019 (2.40-2.36)
Clashscore	102246	4595 (2.40-2.36)
Ramachandran outliers	100387	4520 (2.40-2.36)
Sidechain outliers	100360	4522 (2.40-2.36)
RSRZ outliers	91569	4034 (2.40-2.36)

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  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. 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	395	<div> <div>11%</div> <div>81%</div> <div>12%</div> <div>7%</div> </div>
1	B	395	<div> <div>6%</div> <div>41%</div> <div>5%</div> <div>53%</div> </div>
2	C	19	<div> <div>5%</div> <div>68%</div> <div>26%</div> <div>5%</div> </div>
3	D	17	<div> <div>6%</div> <div>76%</div> <div>12%</div> <div>12%</div> </div>

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 crite-

ria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
5	SO4	A	1382	-	-	-	X
6	GOL	A	1377	-	-	-	X
6	GOL	A	1379	-	-	-	X
6	GOL	A	1383	-	-	X	-
6	GOL	B	1301	-	-	-	X

## 2 Entry composition

There are 9 unique types of molecules in this entry. The entry contains 5489 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 PFV INTEGRASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	368	Total	C	N	O	S	0	1	0
			2928	1877	515	532	4			
1	B	184	Total	C	N	O	S	0	0	0
			1433	930	233	269	1			

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	GLY	-	EXPRESSION TAG	UNP P14350
A	-1	PRO	-	EXPRESSION TAG	UNP P14350
A	0	GLY	-	EXPRESSION TAG	UNP P14350
A	217	SER	GLY	VARIANT	UNP P14350
A	218	GLY	SER	VARIANT	UNP P14350
B	-2	GLY	-	EXPRESSION TAG	UNP P14350
B	-1	PRO	-	EXPRESSION TAG	UNP P14350
B	0	GLY	-	EXPRESSION TAG	UNP P14350
B	217	SER	GLY	VARIANT	UNP P14350
B	218	GLY	SER	VARIANT	UNP P14350

- Molecule 2 is a DNA chain called 19 NUCLEOTIDE PREPROCESSED PFV DONOR DNA (NON-TRANSFERRED STRAND).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	19	Total	C	N	O	P	0	0	0
			387	187	68	114	18			

- Molecule 3 is a DNA chain called 17 NUCLEOTIDE PREPROCESSED PFV DONOR DNA (TRANSFERRED STRAND) \*AP\*CP\*A)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	D	17	Total	C	N	O	P	0	0	0
			345	166	65	98	16			

- Molecule 4 is ZINC ION (three-letter code: ZN) (formula: Zn).

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

- Molecule 5 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



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

- Molecule 6 is GLYCEROL (three-letter code: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).

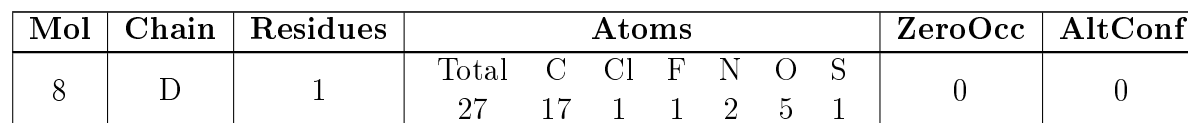


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			6	3	3		
6	A	1	Total	C	O	0	0
			6	3	3		
6	A	1	Total	C	O	0	0
			6	3	3		
6	A	1	Total	C	O	0	0
			6	3	3		
6	B	1	Total	C	O	0	0
			6	3	3		

- Molecule 7 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	B	1	Total	Mg	0	0
			1	1		
7	A	2	Total	Mg	0	0
			2	2		

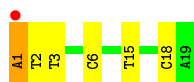
- Molecule 8 is 2-(3-CHLORO-4-FLUOROBENZYL)-6,7-DIHYDROXY-N,N-DIMETHYL-L-1-OXO-2,3-DIHYDRO-1H-ISOINDOLE-4-SULFONAMIDE (three-letter code: XZ2) (formula: C<sub>17</sub>H<sub>16</sub>ClFN<sub>2</sub>O<sub>5</sub>S).



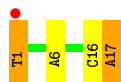
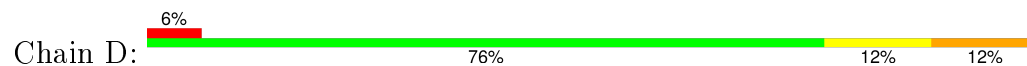
- | Mol | Chain | Residues | Atoms              | ZeroOcc | AltConf |
|-----|-------|----------|--------------------|---------|---------|
| 9   | A     | 207      | Total O<br>207 207 | 0       | 0       |
| 9   | B     | 54       | Total O<br>54 54   | 0       | 0       |
| 9   | C     | 31       | Total O<br>31 31   | 0       | 0       |
| 9   | D     | 28       | Total O<br>28 28   | 0       | 0       |







- Molecule 3: 17 NUCLEOTIDE PREPROCESSED PFV DONOR DNA (TRANSFERRED STRAND) \*AP\*CP\*A)-3'



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	159.42Å 159.42Å 123.68Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	38.72 – 2.38 38.67 – 2.38	Depositor EDS
% Data completeness (in resolution range)	99.1 (38.72-2.38) 99.1 (38.67-2.38)	Depositor EDS
$R_{merge}$	0.10	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.03 (at 2.39Å)	Xtriage
Refinement program	REFMAC 5.6.0117	Depositor
R, $R_{free}$	0.195 , 0.223 0.191 , 0.218	Depositor DCC
$R_{free}$ test set	3233 reflections (5.35%)	DCC
Wilson B-factor (Å <sup>2</sup> )	56.1	Xtriage
Anisotropy	0.349	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 41.7	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 63629 reflections	Xtriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	5489	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	56.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.75% 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, 0.375 respectively for untwinned datasets, and 0.333, 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: SO4, GOL, MG, ZN, XZ2

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	0.64	1/3010 (0.0%)	0.71	2/4108 (0.0%)
1	B	0.64	3/1473 (0.2%)	0.65	0/2016
2	C	0.49	0/433	1.09	4/667 (0.6%)
3	D	0.47	0/387	1.16	4/595 (0.7%)
All	All	0.62	4/5303 (0.1%)	0.78	10/7386 (0.1%)

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	154	TRP	CD2-CE2	6.58	1.49	1.41
1	B	198	TRP	CD2-CE2	5.26	1.47	1.41
1	A	81	TRP	CD2-CE2	5.22	1.47	1.41
1	B	242	TRP	CD2-CE2	5.18	1.47	1.41

The worst 5 of 10 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	1	DA	P-O3'-C3'	10.47	132.27	119.70
3	D	1	DT	P-O3'-C3'	10.12	131.84	119.70
1	A	69	ARG	NE-CZ-NH2	-8.16	116.22	120.30
3	D	17	DA	O5'-P-OP2	-7.12	99.29	105.70
1	A	69	ARG	NE-CZ-NH1	6.24	123.42	120.30

There are no chirality outliers.

There are no planarity outliers.

## 5.2 Too-close contacts ⓘ

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	2928	0	2958	31	0
1	B	1433	0	1406	7	0
2	C	387	0	218	6	0
3	D	345	0	193	3	0
4	A	1	0	0	0	0
5	A	10	0	0	0	0
5	B	5	0	0	0	0
6	A	24	0	32	7	0
6	B	6	0	8	0	0
7	A	2	0	0	0	0
7	B	1	0	0	0	0
8	D	27	0	14	3	0
9	A	207	0	0	3	1
9	B	54	0	0	0	0
9	C	31	0	0	0	0
9	D	28	0	0	0	0
All	All	5489	0	4829	46	1

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 46 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)
6:A:1383:GOL:C3	2:C:3:DT:H3	1.55	1.19
6:A:1383:GOL:H32	2:C:3:DT:N3	1.66	1.10
6:A:1383:GOL:H32	2:C:3:DT:H3	0.81	0.97
1:A:137:GLN:H	6:A:1378:GOL:H2	1.35	0.90
1:B:258:SER:O	1:B:261:LEU:O	2.01	0.78

All (1) 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)
9:A:2014:HOH:O	9:A:2135:HOH:O[8_554]	2.05	0.15

## 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	367/395 (93%)	356 (97%)	11 (3%)	0	100	100
1	B	182/395 (46%)	169 (93%)	13 (7%)	0	100	100
All	All	549/790 (70%)	525 (96%)	24 (4%)	0	100	100

There are no Ramachandran outliers to report.

### 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	328/354 (93%)	322 (98%)	6 (2%)	66	83
1	B	157/354 (44%)	151 (96%)	6 (4%)	40	58
All	All	485/708 (68%)	473 (98%)	12 (2%)	55	74

5 of 12 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	366	ILE
1	B	149	MET
1	B	215	GLN

*Continued on next page...*

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Mol	Chain	Res	Type
1	A	364	VAL
1	B	168	LYS

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

Mol	Chain	Res	Type
1	A	97	GLN
1	A	357	HIS

### 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 13 ligands modelled in this entry, 4 are monoatomic - leaving 9 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	SO4	A	1376	-	4,4,4	0.42	0	6,6,6	0.35	0
6	GOL	A	1377	-	5,5,5	0.38	0	5,5,5	0.89	0
6	GOL	A	1378	-	5,5,5	0.36	0	5,5,5	0.43	0
6	GOL	A	1379	-	5,5,5	0.24	0	5,5,5	0.39	0
5	SO4	A	1382	-	4,4,4	0.53	0	6,6,6	0.62	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
6	GOL	A	1383	-	5,5,5	0.39	0	5,5,5	0.99	0
5	SO4	B	1300	-	4,4,4	0.37	0	6,6,6	0.32	0
6	GOL	B	1301	-	5,5,5	0.34	0	5,5,5	0.40	0
8	XZ2	D	1018	7	29,29,29	2.20	6 (20%)	35,45,45	2.75	10 (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	SO4	A	1376	-	-	0/0/0/0	0/0/0/0
6	GOL	A	1377	-	-	0/4/4/4	0/0/0/0
6	GOL	A	1378	-	-	0/4/4/4	0/0/0/0
6	GOL	A	1379	-	-	0/4/4/4	0/0/0/0
5	SO4	A	1382	-	-	0/0/0/0	0/0/0/0
6	GOL	A	1383	-	-	0/4/4/4	0/0/0/0
5	SO4	B	1300	-	-	0/0/0/0	0/0/0/0
6	GOL	B	1301	-	-	0/4/4/4	0/0/0/0
8	XZ2	D	1018	7	-	0/16/28/28	0/3/3/3

The worst 5 of 6 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	D	1018	XZ2	CAX-CAP	-5.99	1.38	1.49
8	D	1018	XZ2	SBA-NAY	-3.90	1.48	1.62
8	D	1018	XZ2	CAO-CAV	2.36	1.53	1.50
8	D	1018	XZ2	CAW-SBA	4.39	1.83	1.77
8	D	1018	XZ2	OAD-SBA	5.02	1.49	1.43

The worst 5 of 10 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	D	1018	XZ2	OAE-SBA-OAD	-8.61	104.62	119.47
8	D	1018	XZ2	OAC-CAP-CAX	-5.31	121.48	128.96
8	D	1018	XZ2	CAL-CAW-CAV	-5.16	118.33	121.80
8	D	1018	XZ2	CAU-CAM-CAT	-2.96	118.45	120.36
8	D	1018	XZ2	CAK-CAT-CAM	2.10	121.66	118.55

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

4 monomers are involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	1377	GOL	1	0
6	A	1378	GOL	1	0
6	A	1383	GOL	5	0
8	D	1018	XZ2	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, 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	368/395 (93%)	0.50	45 (12%) 5 6	34, 48, 90, 130	0
1	B	184/395 (46%)	0.50	25 (13%) 4 5	39, 54, 121, 145	0
2	C	19/19 (100%)	-0.02	1 (5%) 30 34	38, 56, 80, 108	0
3	D	17/17 (100%)	-0.10	1 (5%) 26 30	40, 49, 73, 115	1 (5%)
All	All	588/826 (71%)	0.47	72 (12%) 5 6	34, 49, 101, 145	1 (0%)

The worst 5 of 72 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	8	LEU	6.2
1	B	280	ASN	5.3
1	B	279	ALA	5.2
1	B	292	LEU	4.9
1	B	116	ASP	4.8

### 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, 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	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
5	SO4	A	1382	5/5	0.90	0.25	13.10	42,43,50,53	5
6	GOL	A	1377	6/6	0.77	0.23	7.45	71,78,84,85	0
6	GOL	B	1301	6/6	0.91	0.26	2.36	68,72,74,82	0
6	GOL	A	1379	6/6	0.95	0.18	2.35	68,76,78,86	0
8	XZ2	D	1018	27/27	0.96	0.12	-0.41	36,45,63,67	0
5	SO4	B	1300	5/5	0.97	0.17	-0.44	72,79,90,93	0
4	ZN	A	393	1/1	1.00	0.12	-1.19	44,44,44,44	0
7	MG	A	1381	1/1	0.98	0.08	-1.56	39,39,39,39	0
6	GOL	A	1378	6/6	0.71	0.28	-	63,74,81,89	0
7	MG	B	1302	1/1	0.97	0.26	-	97,97,97,97	0
5	SO4	A	1376	5/5	0.97	0.16	-	81,84,92,94	0
6	GOL	A	1383	6/6	0.89	0.29	-	58,61,71,73	0
7	MG	A	1380	1/1	0.99	0.06	-	43,43,43,43	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.