



# wwPDB X-ray Structure Validation Summary Report i

Nov 20, 2014 – 09:31 PM EST

PDB ID : 4C27  
Title : Crystal structure of Trypanosoma cruzi CYP51 bound to the inhibitor (R)-N-(3-(1H-indol-3-yl)-1-oxo-1-(pyridin-4-ylamino)propan-2-yl)-2-fluoro-4-(4-(4-(trifluoromethyl)phenyl)piperazin-1-yl)benzamide  
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Deposited on : 2013-08-16  
Resolution : 1.95 Å(reported)

This is a wwPDB 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/ValidationPDFNotes.html>

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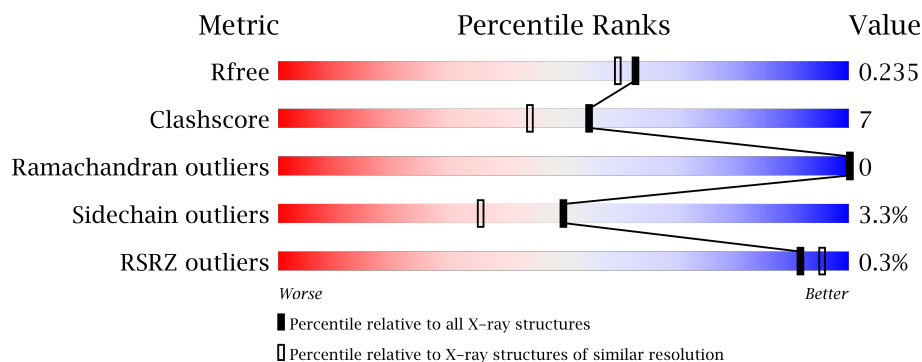
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Mogul	:	1.16 November 2013
Xtriage (Phenix)	:	dev-1439
EDS	:	stable24195
Percentile statistics	:	21963
Refmac	:	5.8.0049
CCP4	:	6.1.3
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP)	:	stable24195

# 1 Overall quality at a glance

The reported resolution of this entry is 1.95 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))
$R_{free}$	66092	1321 (1.96-1.96)
Clashscore	79885	1488 (1.96-1.96)
Ramachandran outliers	78287	1475 (1.96-1.96)
Sidechain outliers	78261	1475 (1.96-1.96)
RSRZ outliers	66119	1321 (1.96-1.96)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	467	
1	B	467	

The following table lists non-polymeric compounds that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Geometry	Electron density
4	EDO	A	1480	-	X
4	EDO	B	1479	-	X

## 2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 7823 atoms, of which 0 are hydrogen and 0 are deuterium.

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 STEROL 14-ALPHA DEMETHYLASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	444	Total	C	N	O	S	0	8	0
			3613	2306	639	640	28			
1	B	443	Total	C	N	O	S	0	4	0
			3546	2265	619	634	28			

There are 28 discrepancies between the modelled and reference sequences:

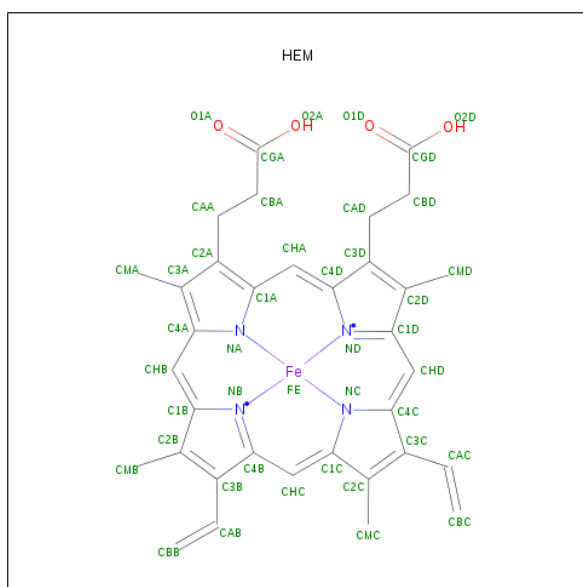
Chain	Residue	Modelled	Actual	Comment	Reference
A	21	MET	-	EXPRESSION TAG	UNP Q5I4E1
A	22	ALA	-	EXPRESSION TAG	UNP Q5I4E1
A	23	LYS	-	EXPRESSION TAG	UNP Q5I4E1
A	24	LYS	-	EXPRESSION TAG	UNP Q5I4E1
A	25	THR	-	EXPRESSION TAG	UNP Q5I4E1
A	26	SER	-	EXPRESSION TAG	UNP Q5I4E1
A	27	SER	-	EXPRESSION TAG	UNP Q5I4E1
A	28	LYS	-	EXPRESSION TAG	UNP Q5I4E1
A	482	HIS	-	EXPRESSION TAG	UNP Q5I4E1
A	483	HIS	-	EXPRESSION TAG	UNP Q5I4E1
A	484	HIS	-	EXPRESSION TAG	UNP Q5I4E1
A	485	HIS	-	EXPRESSION TAG	UNP Q5I4E1
A	486	HIS	-	EXPRESSION TAG	UNP Q5I4E1
A	487	HIS	-	EXPRESSION TAG	UNP Q5I4E1
B	21	MET	-	EXPRESSION TAG	UNP Q5I4E1
B	22	ALA	-	EXPRESSION TAG	UNP Q5I4E1
B	23	LYS	-	EXPRESSION TAG	UNP Q5I4E1
B	24	LYS	-	EXPRESSION TAG	UNP Q5I4E1
B	25	THR	-	EXPRESSION TAG	UNP Q5I4E1
B	26	SER	-	EXPRESSION TAG	UNP Q5I4E1
B	27	SER	-	EXPRESSION TAG	UNP Q5I4E1
B	28	LYS	-	EXPRESSION TAG	UNP Q5I4E1
B	482	HIS	-	EXPRESSION TAG	UNP Q5I4E1
B	483	HIS	-	EXPRESSION TAG	UNP Q5I4E1
B	484	HIS	-	EXPRESSION TAG	UNP Q5I4E1

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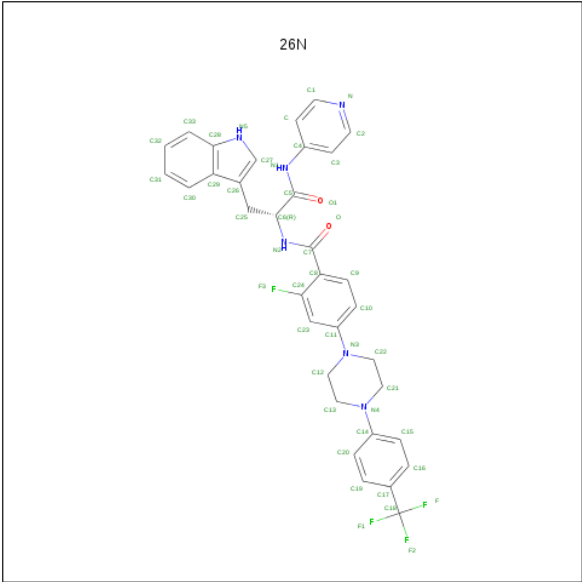
Chain	Residue	Modelled	Actual	Comment	Reference
B	485	HIS	-	EXPRESSION TAG	UNP Q5I4E1
B	486	HIS	-	EXPRESSION TAG	UNP Q5I4E1
B	487	HIS	-	EXPRESSION TAG	UNP Q5I4E1

- Molecule 2 is PROTOPORPHYRIN IX CONTAINING FE (three-letter code: HEM) (formula:  $C_{34}H_{32}FeN_4O_4$ ).



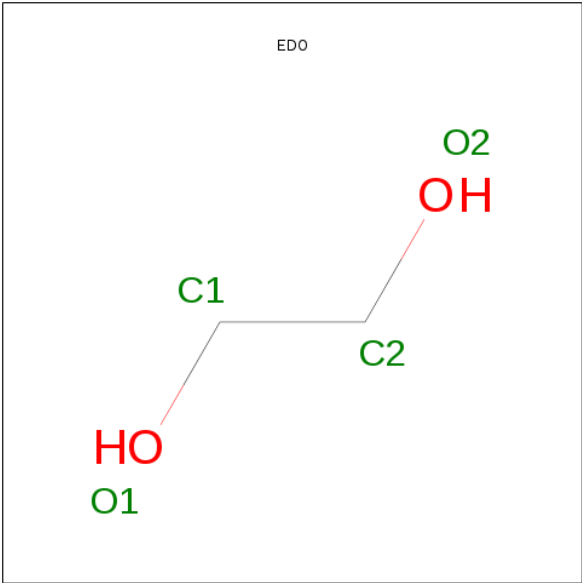
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		
2	B	1	Total	C	Fe	N	O	0	0
			43	34	1	4	4		

- Molecule 3 is NALPHA-(2-FLUORO-4-{4-[4-(TRIFLUOROMETHYL)PHENYL]PIPERAZIN-1-YL}BENZOYL)-N-PYRIDIN-4-YL-D-TRYPTOPHANAMIDE (three-letter code: 26N) (formula:  $C_{34}H_{30}F_4N_6O_2$ ).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	F	N	O	0	0
			46	34	4	6	2		
3	B	1	Total	C	F	N	O	0	1
			92	68	8	12	4		

- 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		

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

- 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		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	246	Total	O	0	0
			246	246		
6	B	181	Total	O	0	0
			181	181		



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	73.10Å 79.16Å 176.94Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	72.36 – 1.95 72.26 – 1.95	Depositor EDS
% Data completeness (in resolution range)	98.9 (72.36-1.95) 98.9 (72.26-1.95)	Depositor EDS
$R_{merge}$	0.17	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.67 (at 1.95Å)	Xtriage
Refinement program	REFMAC 5.7.0032	Depositor
R, $R_{free}$	0.183 , 0.233 0.189 , 0.235	Depositor DCC
$R_{free}$ test set	3773 reflections (5.31%)	DCC
Wilson B-factor (Å <sup>2</sup> )	28.3	Xtriage
Anisotropy	0.190	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 27.8	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 74813 reflections	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	7823	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.29% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.



## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: HEM, CL, 26N, EDO

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	0.93	2/3698 (0.1%)	1.02	15/4998 (0.3%)
1	B	0.93	0/3630	0.97	10/4915 (0.2%)
All	All	0.93	2/7328 (0.0%)	1.00	25/9913 (0.3%)

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
1	A	0	1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	58	ARG	CD-NE	-5.35	1.37	1.46
1	A	207	SER	CB-OG	5.06	1.48	1.42

The worst 5 of 25 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	58	ARG	NE-CZ-NH2	-11.12	114.74	120.30
1	A	61	ARG	NE-CZ-NH2	-10.64	114.98	120.30
1	A	58	ARG	NE-CZ-NH1	9.97	125.29	120.30
1	A	61	ARG	NE-CZ-NH1	7.89	124.25	120.30
1	A	271	ARG	NE-CZ-NH2	-7.73	116.43	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	29	PRO	Peptide

## 5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3613	0	3616	45	0
1	B	3546	0	3523	51	0
2	A	43	0	30	6	0
2	B	43	0	30	6	0
3	A	46	0	0	0	0
3	B	92	0	0	2	0
4	A	8	0	12	0	0
4	B	4	0	6	0	0
5	A	1	0	0	0	0
6	A	246	0	0	4	0
6	B	181	0	0	5	0
All	All	7823	0	7217	100	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 7.

The worst 5 of 100 close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:B:141[B]:ASN:HD22	1:B:141[B]:ASN:H	1.03	0.98
1:B:149:GLU:HG2	1:B:181:GLN:HG3	1.62	0.81
1:A:44:HIS:HD2	1:A:71:SER:H	1.33	0.75
1:B:449[A]:ARG:CG	1:B:449[A]:ARG:HH11	1.98	0.75
1:A:149:GLU:OE2	6:A:2091:HOH:O	2.06	0.74

There are no symmetry-related clashes.

## 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	448/467 (96%)	440 (98%)	8 (2%)	0	100	100
1	B	443/467 (95%)	435 (98%)	8 (2%)	0	100	100
All	All	891/934 (95%)	875 (98%)	16 (2%)	0	100	100

There are no Ramachandran outliers to report.

### 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	390/409 (95%)	379 (97%)	11 (3%)	56	43
1	B	382/409 (93%)	367 (96%)	15 (4%)	43	27
All	All	772/818 (94%)	746 (97%)	26 (3%)	50	34

5 of 26 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	37	VAL
1	B	188	LEU
1	B	449[A]	ARG
1	B	162	GLU
1	B	166	ASN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 22 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	309	HIS
1	A	420	HIS
1	B	334	ASN
1	A	331	ASN
1	A	334	ASN

### 5.3.3 RNA ⓘ

There are no RNA chains 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 9 ligands modelled in this entry, 1 is 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	$\# Z  > 2$
2	HEM	A	1450	1,3	42,50,50	3.28	15 (35%)	27,82,82	2.22	8 (29%)
3	26N	A	1460	2	51,51,51	1.30	5 (9%)	73,73,73	1.76	16 (21%)
4	EDO	A	1479	-	3,3,3	0.45	0	2,2,2	0.03	0
4	EDO	A	1480	-	3,3,3	0.35	0	2,2,2	1.57	1 (50%)
2	HEM	B	1450	1,3	42,50,50	3.25	15 (35%)	27,82,82	1.15	2 (7%)
3	26N	B	1460[A]	2	51,51,51	1.39	3 (5%)	73,73,73	1.73	15 (20%)
3	26N	B	1460[B]	2	51,51,51	1.51	4 (7%)	73,73,73	1.56	10 (13%)
4	EDO	B	1479	-	3,3,3	0.33	0	2,2,2	0.63	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	HEM	A	1450	1,3	-	0/14/114/114	0/0/8/8
3	26N	A	1460	2	-	0/34/44/44	0/6/6/6
4	EDO	A	1479	-	-	0/1/1/1	0/0/0/0
4	EDO	A	1480	-	-	0/1/1/1	0/0/0/0
2	HEM	B	1450	1,3	-	0/14/114/114	0/0/8/8
3	26N	B	1460[A]	2	-	0/34/44/44	0/6/6/6
3	26N	B	1460[B]	2	-	0/34/44/44	0/6/6/6
4	EDO	B	1479	-	-	0/1/1/1	0/0/0/0

The worst 5 of 42 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1450	HEM	C3C-C2C	-11.66	1.36	1.45
2	B	1450	HEM	C3C-C2C	-11.43	1.36	1.45
2	A	1450	HEM	C3B-C2B	-10.88	1.35	1.45
2	B	1450	HEM	C3B-C2B	-10.80	1.35	1.45
3	B	1460[B]	26N	C8-C24	7.57	1.49	1.38

The worst 5 of 52 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	1460[B]	26N	C21-N4-C13	5.87	123.75	111.66
3	A	1460	26N	C21-N4-C13	5.80	123.61	111.66
3	A	1460	26N	C22-N3-C12	5.69	123.36	111.66
2	A	1450	HEM	CAD-CBD-CGD	-5.11	103.89	113.53
3	B	1460[A]	26N	C8-C7-N2	5.07	125.49	116.92

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

## 5.7 Other polymers ⓘ

There are no such residues in this entry.

## 5.8 Polymer linkage issues

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	444/467 (95%)	-0.27	2 (0%) 88 94	15, 25, 43, 73	0
1	B	443/467 (94%)	-0.22	1 (0%) 93 96	16, 26, 46, 70	0
All	All	887/934 (94%)	-0.25	3 (0%) 91 95	15, 26, 45, 73	0

All (3) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	258	THR	4.6
1	A	41	PHE	3.6
1	A	29	PRO	3.0

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

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

### 6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

### 6.4 Ligands ⓘ

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	RSR	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
4	EDO	A	1480	4/4	0.27	7.26	43,49,52,53	0
4	EDO	B	1479	4/4	0.19	4.93	48,53,53,65	0
4	EDO	A	1479	4/4	0.13	1.94	31,35,41,43	0
3	26N	B	1460[A]	46/46	0.11	1.17	15,19,23,25	46
3	26N	B	1460[B]	46/46	0.11	1.17	15,20,26,27	46
2	HEM	B	1450	43/43	0.11	0.69	17,21,31,34	0
2	HEM	A	1450	43/43	0.09	0.09	16,18,26,35	0
3	26N	A	1460	46/46	0.09	-0.05	18,23,28,33	0
5	CL	A	1481	1/1	0.08	-0.95	52,52,52,52	0

## 6.5 Other polymers ⓘ

There are no such residues in this entry.