



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 10:50 PM UTC

PDB ID : 1ZOD / pdb_00001zod
Title : Crystal structure of dialkylglycine decarboxylase bound with cesium ion
Authors : Liu, W.; Toney, M.D.
Deposited on : 2005-05-12
Resolution : 1.80 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

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>.

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

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

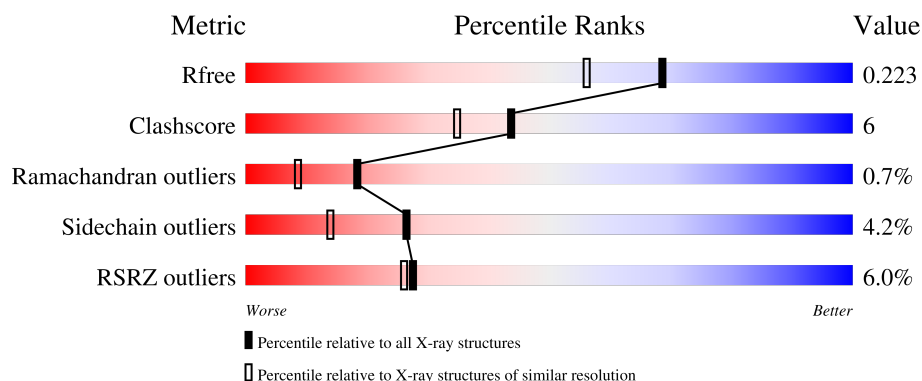
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 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}	180053	7662 (1.80-1.80)
Clashscore	190562	8479 (1.80-1.80)
Ramachandran outliers	187476	8391 (1.80-1.80)
Sidechain outliers	187428	8390 (1.80-1.80)
RSRZ outliers	180081	7663 (1.80-1.80)

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 ≥ 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	433	6% 83% 15% .

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 3474 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 2,2-dialkylglycine decarboxylase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	431	Total	C	N	O	S	0	0	0
			3252	2051	576	607	18			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	15	HIS	GLN	SEE REMARK 999	UNP P16932
A	81	GLU	GLY	SEE REMARK 999	UNP P16932

- Molecule 2 is CESIUM ION (CCD ID: CS) (formula: Cs).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Cs	0	0
			1	1		

- Molecule 3 is SODIUM ION (CCD ID: NA) (formula: Na).

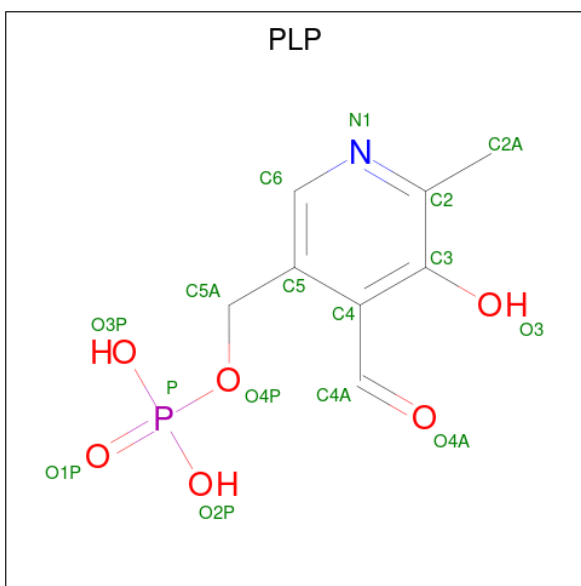
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Na	0	0
			1	1		

- Molecule 4 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (CCD ID: MES) (formula: C₆H₁₃NO₄S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	S	0	0
			12	6	1	4	1		

- Molecule 5 is PYRIDOXAL-5'-PHOSPHATE (CCD ID: PLP) (formula: $C_8H_{10}NO_6P$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	N	O	P	0	0
			15	8	1	5	1		

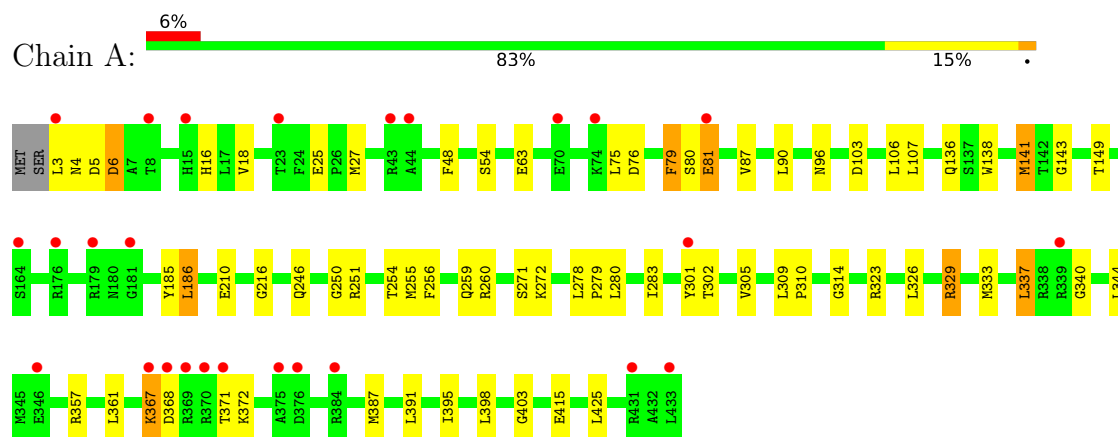
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	193	Total 193	O 193	0	0

3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes 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 ($RSRZ > 2$). 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: 2,2-dialkylglycine decarboxylase



4 Data and refinement statistics

Property	Value	Source
Space group	P 64 2 2	Depositor
Cell constants a, b, c, α , β , γ	150.52Å 150.52Å 84.86Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	50.00 – 1.80 50.00 – 1.80	Depositor EDS
% Data completeness (in resolution range)	(Not available) (50.00-1.80) 96.7 (50.00-1.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.03 (at 1.81Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.200 , 0.226 0.196 , 0.223	Depositor DCC
R_{free} test set	2548 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å ²)	28.8	Xtriage
Anisotropy	0.220	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.39 , 36.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	3474	wwPDB-VP
Average B, all atoms (Å ²)	33.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.16% 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: PLP, CS, MES, NA

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	0.83	1/3309 (0.0%)	1.11	11/4478 (0.2%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	305	VAL	CA-CB	5.69	1.60	1.54

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	54	SER	N-CA-C	7.65	123.36	113.18
1	A	210	GLU	N-CA-C	-6.52	101.85	110.07
1	A	254	THR	N-CA-C	-6.47	99.47	109.24
1	A	16	HIS	N-CA-C	6.18	121.66	112.94
1	A	79	PHE	N-CA-C	-6.13	101.34	110.23
1	A	76	ASP	N-CA-C	5.81	120.09	112.13
1	A	250	GLY	N-CA-C	5.76	123.00	115.40
1	A	251	ARG	N-CA-C	5.76	118.30	111.33
1	A	103	ASP	N-CA-C	5.58	120.95	114.04
1	A	18	VAL	N-CA-C	-5.25	101.95	108.89
1	A	96	ASN	N-CA-C	5.08	117.71	111.82

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	3252	0	3276	40	0
2	A	1	0	0	0	0
3	A	1	0	0	0	0
4	A	12	0	13	0	0
5	A	15	0	7	0	0
6	A	193	0	0	4	1
All	All	3474	0	3296	40	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 6.

All (40) 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:141:MET:HA	1:A:141:MET:HE2	1.42	1.02
1:A:340:GLY:O	1:A:344:LEU:HD13	1.69	0.91
1:A:3:LEU:HD12	1:A:4:ASN:H	1.36	0.89
1:A:141:MET:HA	1:A:141:MET:CE	2.06	0.84
1:A:79:PHE:CE2	1:A:81:GLU:HB2	2.13	0.82
1:A:337:LEU:HD13	1:A:361:LEU:HD12	1.69	0.74
1:A:302:THR:O	6:A:629:HOH:O	2.06	0.74
1:A:216:GLY:HA2	1:A:398:LEU:HD11	1.84	0.59
1:A:3:LEU:HD12	1:A:4:ASN:N	2.12	0.58
1:A:80:SER:HB2	1:A:301:TYR:CZ	2.38	0.58
1:A:368:ASP:HB3	1:A:371:THR:HB	1.85	0.57
1:A:256:PHE:H	1:A:259:GLN:NE2	2.04	0.55
1:A:278:LEU:HG	1:A:279:PRO:HD2	1.89	0.55
1:A:368:ASP:O	1:A:372:LYS:N	2.39	0.54
1:A:367:LYS:O	1:A:367:LYS:HD3	2.09	0.53
1:A:329:ARG:NH2	6:A:588:HOH:O	2.42	0.52
1:A:141:MET:CE	1:A:141:MET:CA	2.85	0.51
1:A:255:MET:HB3	1:A:259:GLN:HE22	1.76	0.51
1:A:309:LEU:HB3	1:A:310:PRO:HD3	1.93	0.50
1:A:329:ARG:CZ	6:A:588:HOH:O	2.59	0.50
1:A:395:ILE:HD11	1:A:403:GLY:HA3	1.94	0.50
1:A:63:GLU:CD	1:A:323:ARG:HH22	2.20	0.49
1:A:79:PHE:CD2	1:A:81:GLU:HB2	2.51	0.46
1:A:260:ARG:NE	1:A:357:ARG:HD2	2.31	0.45
1:A:185:TYR:CD1	1:A:186:LEU:HD13	2.52	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:333:MET:HA	1:A:333:MET:HE2	2.00	0.43
1:A:138:TRP:HA	1:A:149:THR:HG23	2.02	0.42
1:A:278:LEU:HG	1:A:279:PRO:CD	2.50	0.42
1:A:326:LEU:CD2	1:A:329:ARG:HD3	2.49	0.42
1:A:27:MET:HE1	1:A:387:MET:SD	2.60	0.42
1:A:87:VAL:HG13	1:A:107:LEU:HD12	2.01	0.42
1:A:246:GLN:HG3	1:A:272:LYS:HE2	2.01	0.42
1:A:329:ARG:HH11	1:A:329:ARG:HB3	1.85	0.42
1:A:309:LEU:C	1:A:309:LEU:HD23	2.45	0.41
1:A:5:ASP:O	1:A:6:ASP:C	2.62	0.41
1:A:326:LEU:HD23	1:A:329:ARG:CD	2.49	0.41
1:A:141:MET:HE2	1:A:141:MET:CA	2.28	0.41
1:A:280:LEU:CD2	1:A:314:GLY:HA3	2.50	0.41
1:A:301:TYR:CE1	6:A:629:HOH:O	2.71	0.41
1:A:106:LEU:HB3	1:A:283:ILE:HG12	2.03	0.40

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)
6:A:615:HOH:O	6:A:615:HOH:O[10_665]	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	429/433 (99%)	415 (97%)	11 (3%)	3 (1%)	18 8

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	143	GLY

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Mol	Chain	Res	Type
1	A	6	ASP
1	A	271	SER

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	334/336 (99%)	320 (96%)	14 (4%)	26	14

All (14) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	25	GLU
1	A	48	PHE
1	A	75	LEU
1	A	81	GLU
1	A	90	LEU
1	A	136	GLN
1	A	141	MET
1	A	186	LEU
1	A	329	ARG
1	A	337	LEU
1	A	367	LYS
1	A	391	LEU
1	A	415	GLU
1	A	425	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	16	HIS
1	A	52	GLN
1	A	180	ASN
1	A	259	GLN
1	A	322	GLN

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Mol	Chain	Res	Type
1	A	427	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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 4 ligands modelled in this entry, 2 are monoatomic - leaving 2 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	PLP	A	437	1	15,15,16	2.26	4 (26%)	21,22,23	2.22	6 (28%)
4	MES	A	436	-	12,12,12	0.68	0	15,16,16	0.81	1 (6%)

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	PLP	A	437	1	-	0/6/6/8	0/1/1/1
4	MES	A	436	-	-	6/6/14/14	0/1/1/1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	437	PLP	C6-N1	5.33	1.45	1.34
5	A	437	PLP	C2-N1	3.69	1.40	1.33
5	A	437	PLP	C5A-C5	3.21	1.59	1.50
5	A	437	PLP	P-O1P	2.72	1.58	1.50

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	437	PLP	C5-C6-N1	-5.12	115.50	123.83
5	A	437	PLP	C4A-C4-C5	-4.11	116.70	120.94
5	A	437	PLP	C6-C5-C4	3.74	121.16	118.10
5	A	437	PLP	C2A-C2-C3	3.25	124.60	120.80
5	A	437	PLP	C3-C4-C5	3.04	122.24	118.59
5	A	437	PLP	C5A-C5-C6	-2.83	114.75	119.36
4	A	436	MES	C5-N4-C3	2.26	113.71	108.84

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	436	MES	C7-C8-S-O2S
4	A	436	MES	N4-C7-C8-S
4	A	436	MES	C8-C7-N4-C5
4	A	436	MES	C7-C8-S-O1S
4	A	436	MES	C7-C8-S-O3S
4	A	436	MES	C8-C7-N4-C3

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 [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	431/433 (99%)	0.35	26 (6%)	27 26	21, 30, 48, 64	0

All (26) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	3	LEU	7.0
1	A	376	ASP	4.7
1	A	164	SER	3.5
1	A	176	ARG	3.5
1	A	8	THR	3.1
1	A	375	ALA	2.9
1	A	371	THR	2.8
1	A	367	LYS	2.8
1	A	74	LYS	2.7
1	A	81	GLU	2.7
1	A	181	GLY	2.6
1	A	15	HIS	2.5
1	A	368	ASP	2.5
1	A	301	TYR	2.4
1	A	370	ARG	2.4
1	A	44	ALA	2.4
1	A	369	ARG	2.3
1	A	43	ARG	2.2
1	A	431	ARG	2.2
1	A	23	THR	2.1
1	A	339	ARG	2.1
1	A	70	GLU	2.1
1	A	433	LEU	2.1
1	A	384	ARG	2.0
1	A	346	GLU	2.0
1	A	179	ARG	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 oligosaccharides 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($\text{\AA}^2$)	Q<0.9
4	MES	A	436	12/12	0.84	0.16	44,54,57,59	0
3	NA	A	435	1/1	0.97	0.04	24,24,24,24	0
2	CS	A	434	1/1	0.98	0.09	33,33,33,33	1
5	PLP	A	437	15/16	0.98	0.06	22,27,31,36	0

6.5 Other polymers [i](#)

There are no such residues in this entry.