



# Full wwPDB X-ray Structure Validation Report ⓘ

Apr 1, 2014 – 11:20 PM EDT

PDB ID : 1KMK  
Title : E. coli NifS/CsdB protein at 2.20Å with the cysteine perselenide intermediate (residue CSZ).  
Authors : Lima, C.D.; Burley, S.K.; New York SGX Research Center for Structural Genomics (NYSGXRC)  
Deposited on : 2001-12-16  
Resolution : 2.20 Å(reported)

This is a full wwPDB 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 <http://wwpdb.org/ValidationPDFNotes.html>

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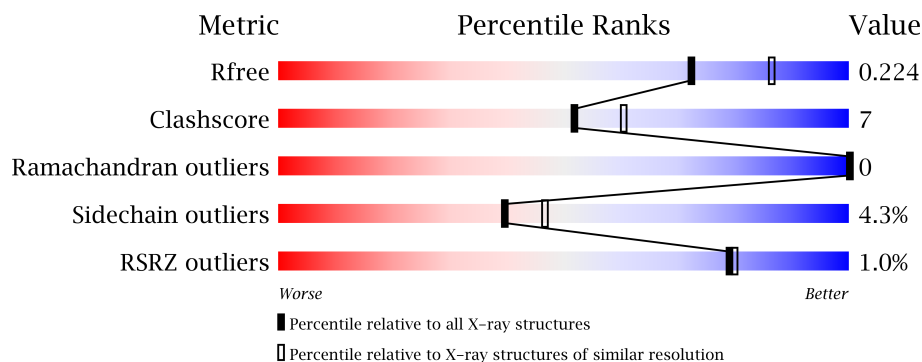
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : **FAILED**  
Xtriage (Phenix) : dev-1439  
EDS : stable22978  
Percentile statistics : 21963  
Refmac : 5.8.0049  
CCP4 : 6.3.0 (Settle)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)  
Validation Pipeline (wwPDB-VP) : stable22978

# 1 Overall quality at a glance


The reported resolution of this entry is 2.20 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	2938 (2.20-2.20)
Clashscore	79885	3751 (2.20-2.20)
Ramachandran outliers	78287	3681 (2.20-2.20)
Sidechain outliers	78261	3682 (2.20-2.20)
RSRZ outliers	66119	2939 (2.20-2.20)

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	406	

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

Mol	Type	Chain	Res	Geometry	Electron density
2	SEC	A	502	-	X

## 2 Entry composition i

There are 4 unique types of molecules in this entry. The entry contains 3626 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.

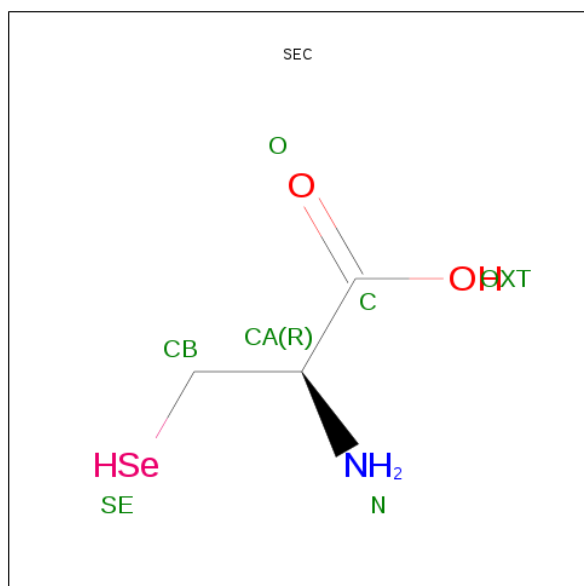
- Molecule 1 is a protein called SELENOCYSTEINE LYASE.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	S	Se			
1	A	405	3120	1976	548	579	16	1	0	0	0

There is a discrepancy between the modelled and reference sequences:

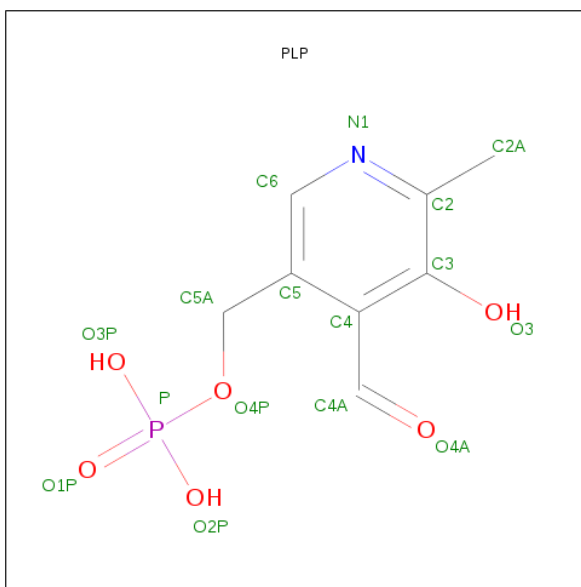
Chain	Residue	Modelled	Actual	Comment	Reference
A	364	CSZ	CYS	MODIFIED RESIDUE	UNP P77444

- Molecule 2 is SELENOCYSTEINE (three-letter code: SEC) (formula: C<sub>3</sub>H<sub>7</sub>NO<sub>2</sub>Se).



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

- Molecule 3 is PYRIDOXAL-5'-PHOSPHATE (three-letter code: PLP) (formula: C<sub>8</sub>H<sub>10</sub>NO<sub>6</sub>P).



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

- Molecule 4 is water.

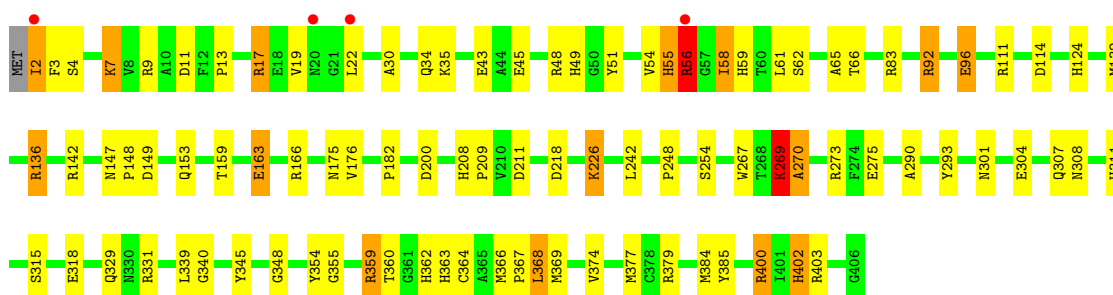
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	485	Total	O	0	0
			485	485		

### 3 Residue-property plots

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 ( $RSRZ > 2$ ). 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: SELENOCYSTEINE LYASE

Chain A: 



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	125.86Å 125.86Å 133.20Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 2.20 19.86 – 2.20	Depositor EDS
% Data completeness (in resolution range)	87.9 (20.00-2.20) 88.4 (19.86-2.20)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.06	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.33 (at 2.19Å)	Xtriage
Refinement program	REFMAC	Depositor
R, $R_{free}$	0.196 , 0.239 0.197 , 0.224	Depositor DCC
$R_{free}$ test set	2450 reflections (5.33%)	DCC
Wilson B-factor (Å <sup>2</sup> )	29.5	Xtriage
Anisotropy	0.068	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 63.2	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtriage
Outliers	0 of 84603 reflections	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	3626	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	38.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.08% of the height of the origin peak. No significant pseudotranslation is detected.*

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

## 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: CSZ, SEC, PLP

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	0.76	0/3183	1.77	55/4330 (1.3%)

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	2

There are no bond length outliers.

All (55) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	56	ARG	CD-NE-CZ	20.38	152.13	123.60
1	A	331	ARG	NE-CZ-NH1	14.75	127.67	120.30
1	A	403	ARG	CD-NE-CZ	13.55	142.57	123.60
1	A	136	ARG	NE-CZ-NH2	-13.40	113.60	120.30
1	A	83	ARG	NE-CZ-NH1	12.60	126.60	120.30
1	A	111	ARG	NE-CZ-NH2	-10.91	114.85	120.30
1	A	92	ARG	NE-CZ-NH2	-10.69	114.95	120.30
1	A	9	ARG	NE-CZ-NH1	10.44	125.52	120.30
1	A	379	ARG	NE-CZ-NH1	10.43	125.52	120.30
1	A	83	ARG	CD-NE-CZ	10.26	137.97	123.60
1	A	403	ARG	NE-CZ-NH1	9.97	125.28	120.30
1	A	331	ARG	NE-CZ-NH2	-9.94	115.33	120.30
1	A	111	ARG	NE-CZ-NH1	9.60	125.10	120.30
1	A	83	ARG	NE-CZ-NH2	-9.49	115.55	120.30
1	A	96	GLU	OE1-CD-OE2	-8.73	112.82	123.30
1	A	48	ARG	NE-CZ-NH2	-8.56	116.02	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	49	HIS	N-CA-CB	-7.83	96.51	110.60
1	A	293	TYR	CB-CG-CD1	-7.72	116.37	121.00
1	A	270	ALA	CB-CA-C	7.38	121.17	110.10
1	A	136	ARG	NE-CZ-NH1	7.38	123.99	120.30
1	A	359	ARG	NE-CZ-NH2	-6.96	116.82	120.30
1	A	270	ALA	CA-C-O	-6.96	105.48	120.10
1	A	114	ASP	CB-CG-OD2	6.41	124.07	118.30
1	A	200	ASP	CB-CG-OD1	6.29	123.96	118.30
1	A	149	ASP	CB-CG-OD1	6.26	123.94	118.30
1	A	269	LYS	CA-CB-CG	6.22	127.08	113.40
1	A	54	VAL	C-N-CA	-6.21	106.17	121.70
1	A	354	TYR	CB-CG-CD1	6.21	124.72	121.00
1	A	354	TYR	CB-CG-CD2	-6.16	117.30	121.00
1	A	17	ARG	CA-CB-CG	5.96	126.51	113.40
1	A	142	ARG	NE-CZ-NH2	-5.95	117.32	120.30
1	A	48	ARG	NH1-CZ-NH2	5.93	125.92	119.40
1	A	55	HIS	CB-CA-C	5.90	122.20	110.40
1	A	211	ASP	CB-CG-OD1	5.89	123.60	118.30
1	A	379	ARG	NE-CZ-NH2	-5.78	117.41	120.30
1	A	9	ARG	NE-CZ-NH2	-5.74	117.43	120.30
1	A	402	HIS	CA-CB-CG	-5.71	103.88	113.60
1	A	51	TYR	CA-CB-CG	-5.69	102.59	113.40
1	A	273	ARG	NE-CZ-NH2	-5.66	117.47	120.30
1	A	142	ARG	NE-CZ-NH1	5.66	123.13	120.30
1	A	65	ALA	CB-CA-C	5.64	118.55	110.10
1	A	2	ILE	CA-C-O	5.62	131.91	120.10
1	A	254	SER	N-CA-CB	-5.54	102.19	110.50
1	A	275	GLU	OE1-CD-OE2	-5.50	116.70	123.30
1	A	226	LYS	CA-CB-CG	-5.45	101.40	113.40
1	A	308	ASN	N-CA-CB	-5.41	100.87	110.60
1	A	43	GLU	OE1-CD-OE2	-5.34	116.90	123.30
1	A	45	GLU	OE1-CD-OE2	-5.32	116.92	123.30
1	A	345	TYR	CA-CB-CG	-5.31	103.31	113.40
1	A	56	ARG	NE-CZ-NH2	5.20	122.90	120.30
1	A	92	ARG	NH1-CZ-NH2	5.14	125.06	119.40
1	A	17	ARG	NE-CZ-NH2	-5.14	117.73	120.30
1	A	166	ARG	NE-CZ-NH1	5.12	122.86	120.30
1	A	384	MET	CA-CB-CG	-5.01	104.78	113.30
1	A	290	ALA	N-CA-CB	5.00	117.11	110.10

There are no chirality outliers.

All (2) planarity outliers are listed below:



Mol	Chain	Res	Type	Group
1	A	270	ALA	Mainchain,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	3120	0	3074	45	0
2	A	6	0	1	2	0
3	A	15	0	6	0	0
4	A	485	0	0	10	4
All	All	3626	0	3081	45	4

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.

All (45) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:364:CSZ:SG	1:A:364:CSZ:SE	2.46	1.23
1:A:55:HIS:CD2	4:A:978:HOH:O	2.35	0.79
1:A:2:ILE:HG12	1:A:3:PHE:H	1.50	0.75
1:A:2:ILE:HD11	1:A:304:GLU:OE1	1.98	0.62
1:A:359:ARG:HD3	1:A:363:HIS:ND1	2.15	0.60
1:A:96:GLU:OE2	4:A:950:HOH:O	2.17	0.59
1:A:307:GLN:HB2	4:A:975:HOH:O	2.04	0.56
1:A:315:SER:O	1:A:318:GLU:HB2	2.06	0.55
1:A:59:HIS:CE1	1:A:62:SER:HB2	2.42	0.54
1:A:362:HIS:HD2	1:A:364:CSZ:N	2.06	0.53
1:A:56:ARG:HG2	1:A:66:THR:HG21	1.90	0.53
1:A:147:ASN:ND2	1:A:153:GLN:HG2	2.24	0.53
1:A:311:HIS:HB3	4:A:736:HOH:O	2.09	0.51
1:A:4:SER:HB3	1:A:7:LYS:HD2	1.94	0.50
1:A:2:ILE:HG13	1:A:301:ASN:ND2	2.27	0.49
1:A:58:ILE:HB	4:A:725:HOH:O	2.11	0.49
1:A:369:MET:SD	1:A:377:MET:HG3	2.52	0.49
1:A:348:GLY:HA3	1:A:360:THR:HG21	1.95	0.49
1:A:30:ALA:O	1:A:226:LYS:HE2	2.12	0.48

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:269:LYS:NZ	4:A:812:HOH:O	2.47	0.48
1:A:124:HIS:HD1	1:A:364:CSZ:SE	2.46	0.48
1:A:248:PRO:HG3	1:A:267:TRP:CE2	2.49	0.48
1:A:359:ARG:HH12	2:A:502:SEC:SE	2.48	0.46
1:A:132:MET:O	1:A:136:ARG:HG3	2.15	0.46
1:A:55:HIS:HB2	4:A:636:HOH:O	2.16	0.45
1:A:163:GLU:H	1:A:163:GLU:CD	2.21	0.44
1:A:17:ARG:HD3	1:A:17:ARG:HH11	1.58	0.44
1:A:218:ASP:HB3	1:A:242:LEU:CD1	2.47	0.44
1:A:11:ASP:O	1:A:13:PRO:HD3	2.18	0.43
1:A:19:VAL:HG12	1:A:355:GLY:HA2	2.00	0.43
1:A:176:VAL:HB	1:A:368:LEU:HD21	2.01	0.43
1:A:4:SER:CB	1:A:7:LYS:HD2	2.48	0.43
1:A:92:ARG:N	1:A:96:GLU:OE1	2.48	0.43
1:A:339:LEU:O	1:A:340:GLY:C	2.57	0.42
1:A:34:GLN:HA	1:A:34:GLN:OE1	2.18	0.42
1:A:92:ARG:HD3	1:A:92:ARG:HH21	1.58	0.42
1:A:56:ARG:NH1	4:A:834:HOH:O	2.43	0.42
1:A:208:HIS:HB2	1:A:209:PRO:CD	2.50	0.42
1:A:22:LEU:HD11	4:A:770:HOH:O	2.19	0.42
1:A:402:HIS:HB3	4:A:730:HOH:O	2.20	0.42
1:A:248:PRO:HG3	1:A:267:TRP:CD2	2.54	0.41
1:A:369:MET:HB3	1:A:374:VAL:O	2.21	0.40
1:A:175:ASN:HD22	2:A:502:SEC:C	2.35	0.40
1:A:366:MET:N	1:A:367:PRO:CD	2.84	0.40
1:A:400:ARG:HD3	1:A:400:ARG:HH11	1.76	0.40

All (4) 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	Distance(Å)	Clash(Å)
4:A:950:HOH:O	4:A:950:HOH:O[7_555]	1.42	0.78
4:A:519:HOH:O	4:A:519:HOH:O[7_555]	1.98	0.22
4:A:541:HOH:O	4:A:676:HOH:O[7_555]	1.99	0.21
4:A:536:HOH:O	4:A:536:HOH:O[7_555]	2.03	0.17

## 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	402/406 (99%)	387 (96%)	15 (4%)	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	327/328 (100%)	313 (96%)	14 (4%)	40	47

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

Mol	Chain	Res	Type
1	A	7	LYS
1	A	35	LYS
1	A	56	ARG
1	A	58	ILE
1	A	61	LEU
1	A	148	PRO
1	A	159	THR
1	A	163	GLU
1	A	182	PRO
1	A	269	LYS
1	A	329	GLN
1	A	368	LEU
1	A	385	TYR
1	A	400	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	20	ASN
1	A	109	ASN
1	A	147	ASN

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Mol	Chain	Res	Type
1	A	244	GLN
1	A	301	ASN
1	A	316	GLN
1	A	362	HIS

### 5.3.3 RNA ⓘ

There are no RNA chains in this entry.

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

Mogul failed to run properly - this section will therefore be empty.

## 5.5 Carbohydrates ⓘ

Mogul failed to run properly - this section will therefore be empty.

## 5.6 Ligand geometry ⓘ

Mogul failed to run properly - this section will therefore be empty.

## 5.7 Other polymers ⓘ

Mogul failed to run properly - this section will therefore be empty.

## 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	404/406 (99%)	-0.74	4 (0%) 79 80	23, 34, 50, 78	0

All (4) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	2	ILE	7.2
1	A	20	ASN	3.1
1	A	56	ARG	2.8
1	A	22	LEU	2.0

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

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(Å <sup>2</sup> )	Q<0.9
1	CSZ	A	364	7/8	0.21	7.53	29,32,34,38	0

### 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(Å <sup>2</sup> )	Q<0.9
2	SEC	A	502	6/7	0.29	6.29	41,42,43,45	0
3	PLP	A	500	15/16	0.07	0.23	27,31,34,36	0

## 6.5 Other polymers ⓘ

There are no such residues in this entry.