wwPDB X-ray Structure Validation Summary Report (i)

Mar 5, 2026 – 09:35 PM UTC

PDB ID	:	3HK9 / pdb_00003hk9
Title	:	Crystal structure of uronate isomerase from Bacillus halodurans complexed with zinc and D-Glucuronate
Authors	:	Fedorov, A.A.; Fedorov, E.V.; Nguyen, T.T.; Raushel, F.M.; Almo, S.C.
Deposited on	:	2009-05-22
Resolution	:	2.10 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
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the (i) 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 (i)) were used in the production of this report:

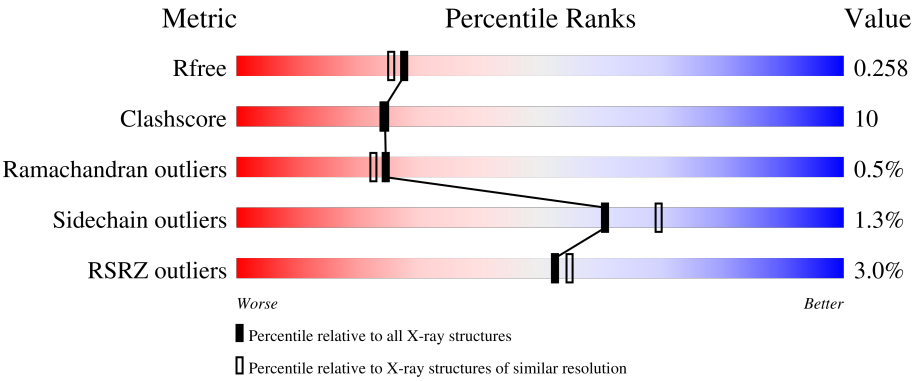
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry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

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (2.10-2.10)

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 <=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	427	2% 73% 22%
1	B	427	5% 72% 21%
1	C	427	2% 74% 20%
1	D	427	% 74% 20%
1	E	427	4% 68% 26%

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Mol	Chain	Length	Quality of chain
1	F	427	3% 73% 21%
1	G	427	2% 71% 23%
1	H	427	4% 73% 21%
1	I	427	2% 74% 21%
1	J	427	3% 72% 22%
1	K	427	4% 73% 22%
1	L	427	2% 75% 20%

2 Entry composition (i)

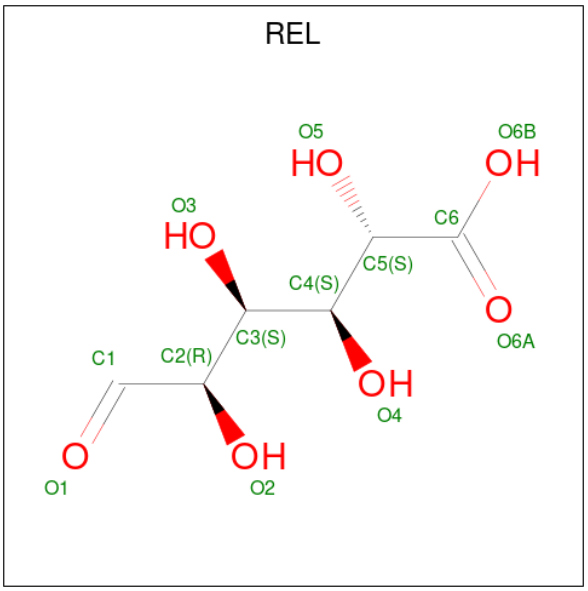
There are 6 unique types of molecules in this entry. The entry contains 42892 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Uronate isomerase.

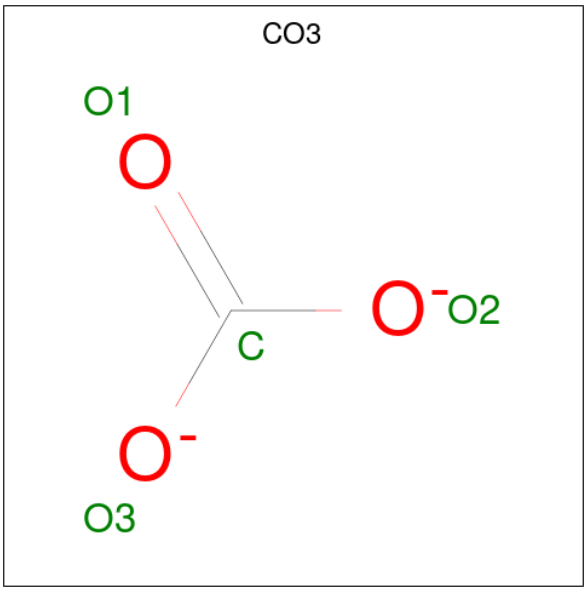
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	413	Total	C	N	O	S	0	0	0
			3404	2170	588	626	20			
1	B	413	Total	C	N	O	S	0	0	0
			3404	2170	588	626	20			
1	C	413	Total	C	N	O	S	0	0	0
			3404	2170	588	626	20			
1	D	413	Total	C	N	O	S	0	0	0
			3404	2170	588	626	20			
1	E	413	Total	C	N	O	S	0	0	0
			3404	2170	588	626	20			
1	F	413	Total	C	N	O	S	0	0	0
			3404	2170	588	626	20			
1	G	413	Total	C	N	O	S	0	0	0
			3404	2170	588	626	20			
1	H	413	Total	C	N	O	S	0	0	0
			3404	2170	588	626	20			
1	I	413	Total	C	N	O	S	0	0	0
			3404	2170	588	626	20			
1	J	413	Total	C	N	O	S	0	0	0
			3404	2170	588	626	20			
1	K	413	Total	C	N	O	S	0	0	0
			3404	2170	588	626	20			
1	L	413	Total	C	N	O	S	0	0	0
			3404	2170	588	626	20			

- Molecule 2 is D-glucuronic acid (CCD ID: REL) (formula: $C_6H_{10}O_7$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total C O 13 6 7	0	0
2	B	1	Total C O 13 6 7	0	0
2	C	1	Total C O 13 6 7	0	0
2	D	1	Total C O 13 6 7	0	0
2	E	1	Total C O 13 6 7	0	0
2	F	1	Total C O 13 6 7	0	0
2	G	1	Total C O 13 6 7	0	0
2	H	1	Total C O 13 6 7	0	0
2	I	1	Total C O 13 6 7	0	0
2	J	1	Total C O 13 6 7	0	0
2	K	1	Total C O 13 6 7	0	0
2	L	1	Total C O 13 6 7	0	0

- Molecule 3 is CARBONATE ION (CCD ID: CO3) (formula: CO_3).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 4 1 3	0	0
3	A	1	Total C O 4 1 3	0	0
3	C	1	Total C O 4 1 3	0	0
3	D	1	Total C O 4 1 3	0	0
3	D	1	Total C O 4 1 3	0	0
3	F	1	Total C O 4 1 3	0	0
3	G	1	Total C O 4 1 3	0	0
3	H	1	Total C O 4 1 3	0	0
3	I	1	Total C O 4 1 3	0	0
3	J	1	Total C O 4 1 3	0	0
3	K	1	Total C O 4 1 3	0	0
3	L	1	Total C O 4 1 3	0	0

- Molecule 4 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total Zn 1 1	0	0
4	B	1	Total Zn 1 1	0	0
4	C	1	Total Zn 1 1	0	0
4	D	1	Total Zn 1 1	0	0
4	E	1	Total Zn 1 1	0	0
4	F	1	Total Zn 1 1	0	0
4	G	1	Total Zn 1 1	0	0
4	H	1	Total Zn 1 1	0	0
4	I	1	Total Zn 1 1	0	0
4	J	1	Total Zn 1 1	0	0
4	K	1	Total Zn 1 1	0	0
4	L	1	Total Zn 1 1	0	0

- Molecule 5 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total Cl 1 1	0	0
5	F	1	Total Cl 1 1	0	0
5	H	1	Total Cl 1 1	0	0
5	K	1	Total Cl 1 1	0	0

- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	155	Total O 155 155	0	0
6	B	123	Total O 123 123	0	0

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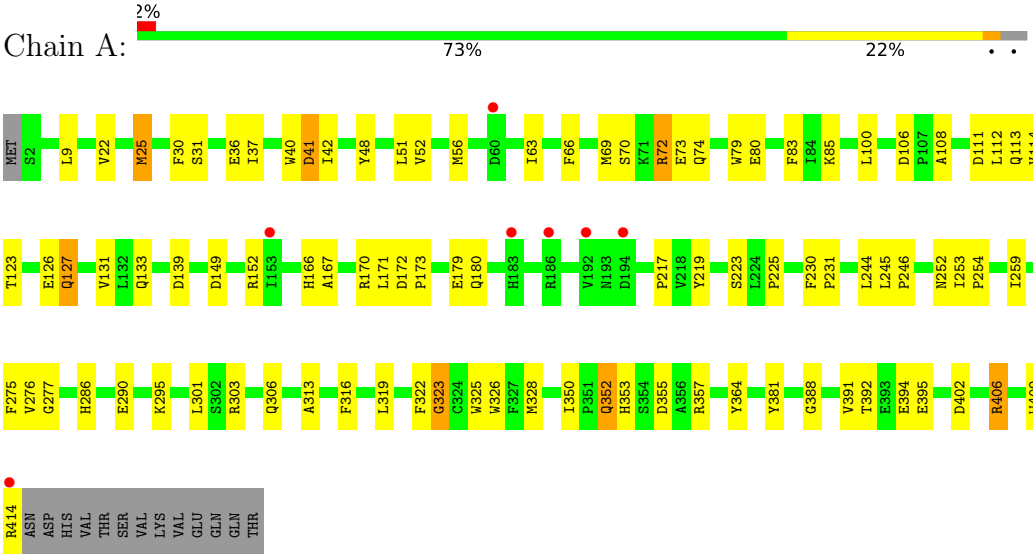
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	C	169	Total O 169 169	0	0
6	D	189	Total O 189 189	0	0
6	E	128	Total O 128 128	0	0
6	F	163	Total O 163 163	0	0
6	G	136	Total O 136 136	0	0
6	H	143	Total O 143 143	0	0
6	I	141	Total O 141 141	0	0
6	J	160	Total O 160 160	0	0
6	K	135	Total O 135 135	0	0
6	L	182	Total O 182 182	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.

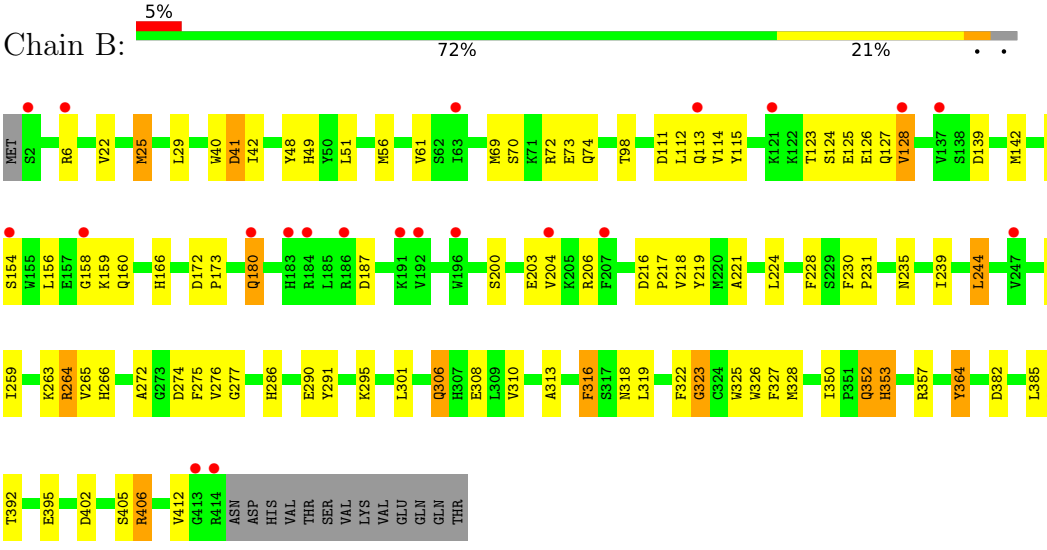
• Molecule 1: Uronate isomerase

Chain A:



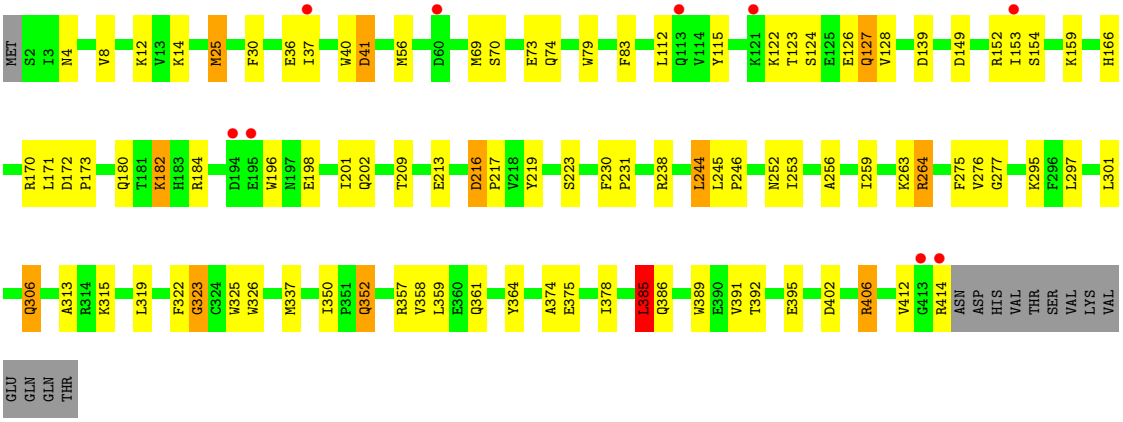
• Molecule 1: Uronate isomerase

Chain B:



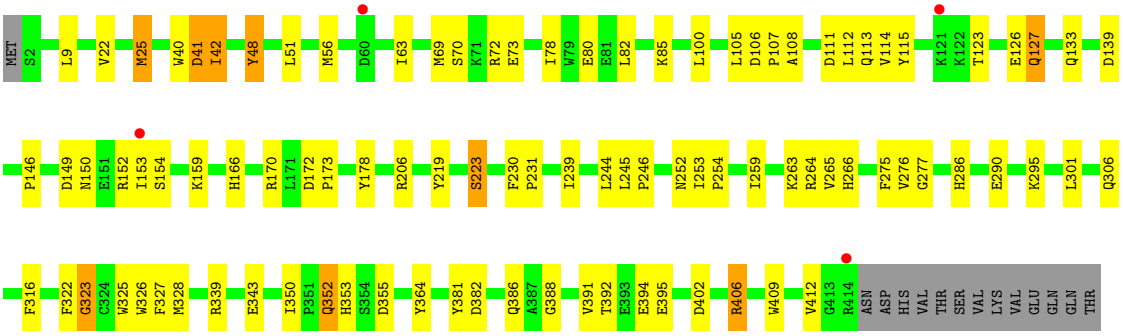
• Molecule 1: Uronate isomerase

Chain C:



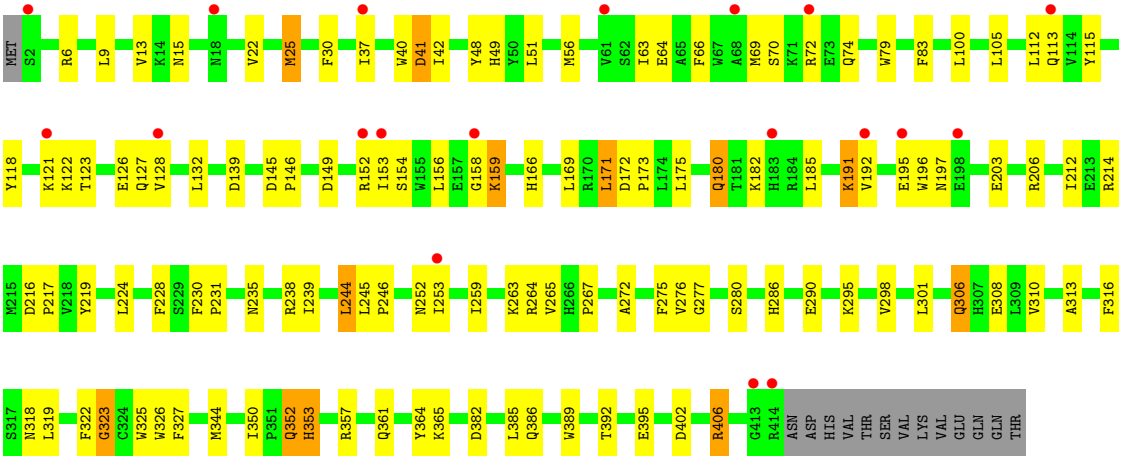
• Molecule 1: Uronate isomerase

Chain D:



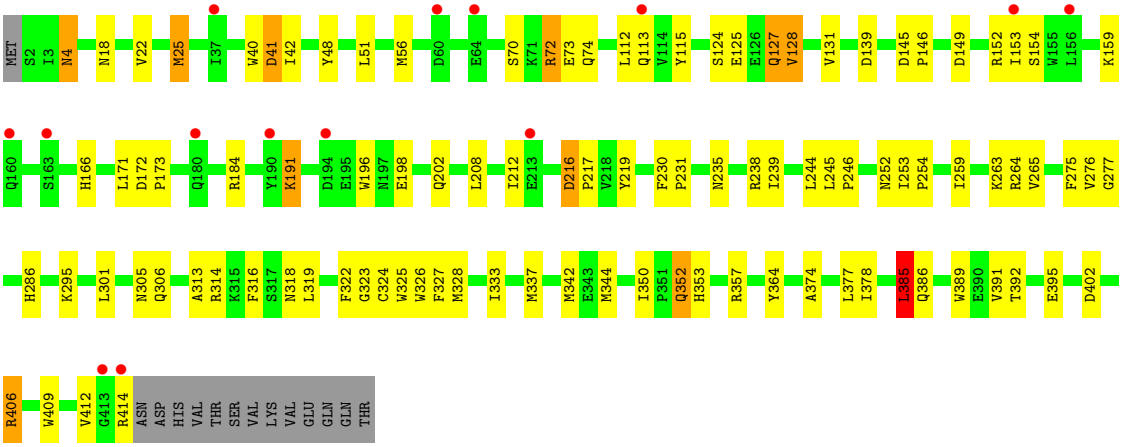
• Molecule 1: Uronate isomerase

Chain E:

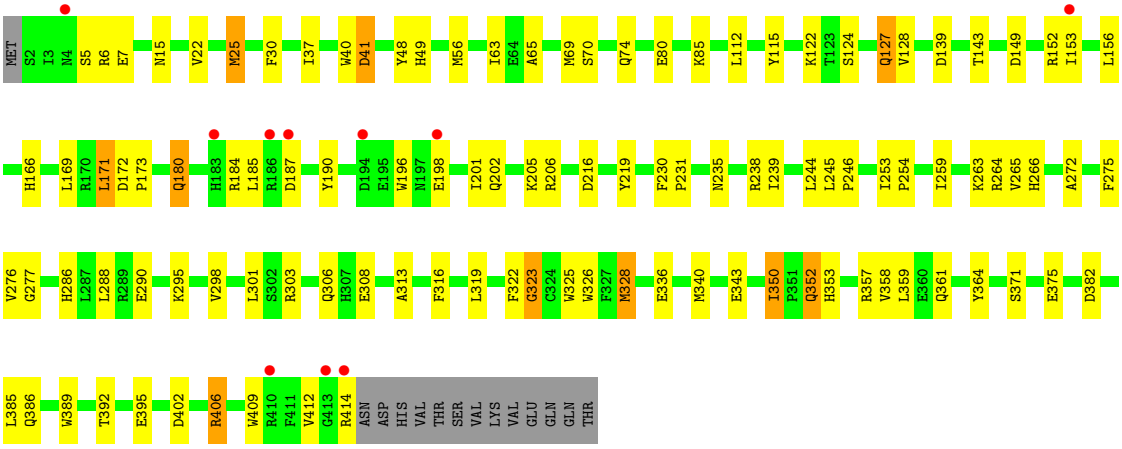


• Molecule 1: Uronate isomerase

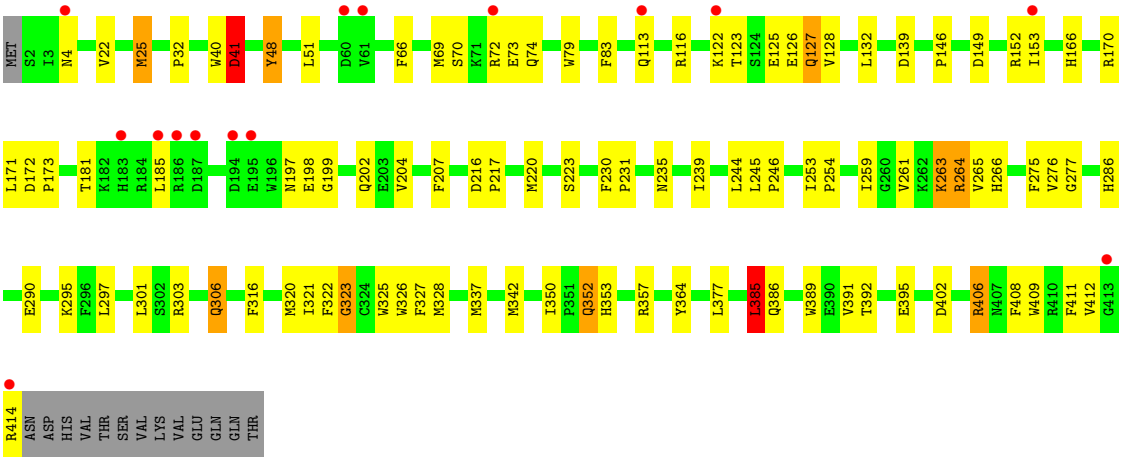
Chain F:



• Molecule 1: Uronate isomerase

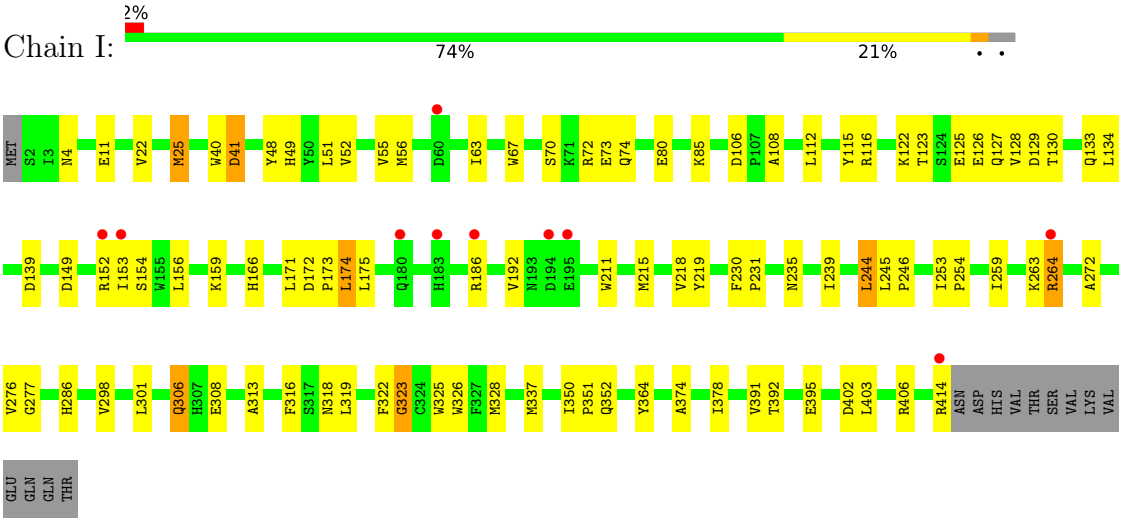


• Molecule 1: Uronate isomerase



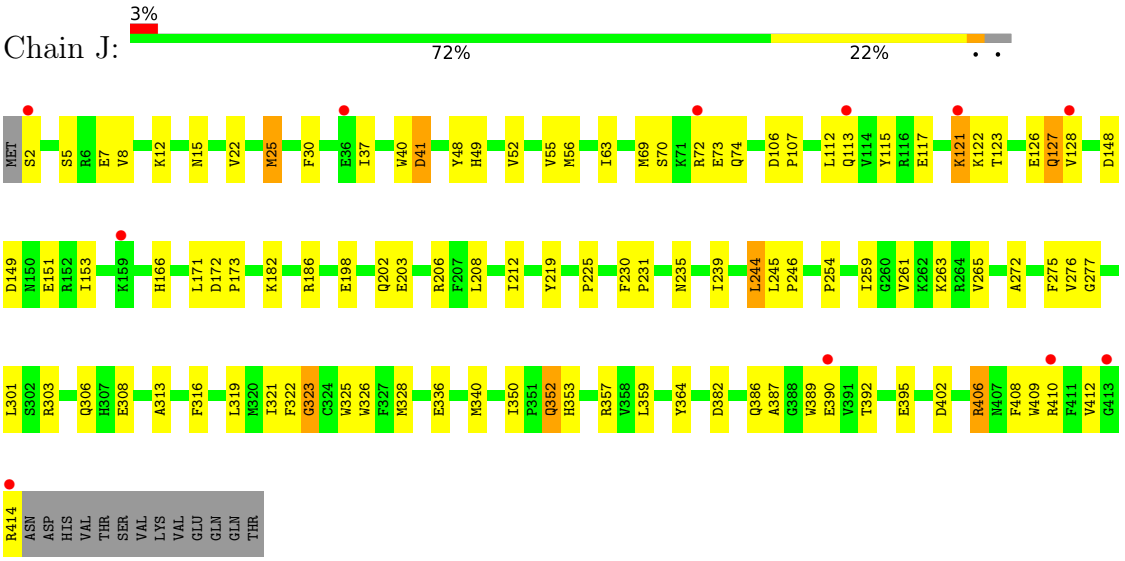
• Molecule 1: Uronate isomerase

Chain I:



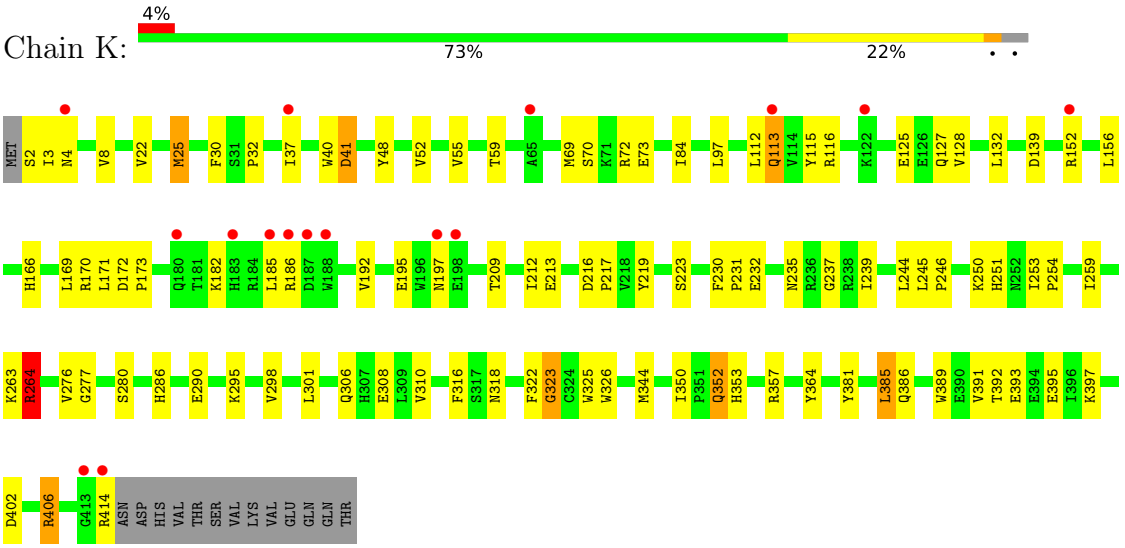
• Molecule 1: Uronate isomerase

Chain J:



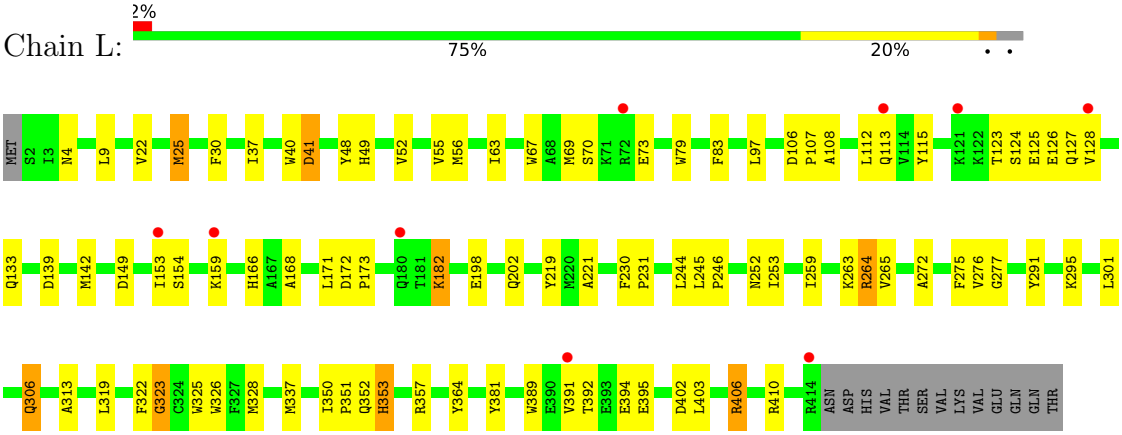
• Molecule 1: Uronate isomerase

Chain K:



• Molecule 1: Uronate isomerase

Chain L:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	274.09Å 156.88Å 185.21Å 90.00° 115.78° 90.00°	Depositor
Resolution (Å)	24.95 – 2.10 24.95 – 2.10	Depositor EDS
% Data completeness (in resolution range)	98.7 (24.95-2.10) 98.7 (24.95-2.10)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.40 (at 2.08Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.227 , 0.258 0.227 , 0.258	Depositor DCC
R_{free} test set	20501 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å^2)	26.5	Xtriage
Anisotropy	0.207	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 38.0	EDS
L-test for twinning[2]	$< \|L\| > = 0.47$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	42892	wwPDB-VP
Average B, all atoms (Å^2)	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 45.58 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.2942e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: REL, ZN, CL, CO3

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	0.38	0/3488	0.94	17/4726 (0.4%)
1	B	0.38	0/3488	0.95	18/4726 (0.4%)
1	C	0.39	0/3488	0.93	14/4726 (0.3%)
1	D	0.40	0/3488	0.95	16/4726 (0.3%)
1	E	0.38	0/3488	0.94	15/4726 (0.3%)
1	F	0.38	0/3488	0.93	18/4726 (0.4%)
1	G	0.39	0/3488	0.94	21/4726 (0.4%)
1	H	0.39	0/3488	0.93	17/4726 (0.4%)
1	I	0.38	0/3488	0.93	12/4726 (0.3%)
1	J	0.39	0/3488	0.92	12/4726 (0.3%)
1	K	0.39	0/3488	0.92	16/4726 (0.3%)
1	L	0.39	0/3488	0.94	17/4726 (0.4%)
All	All	0.39	0/41856	0.94	193/56712 (0.3%)

There are no bond length outliers.

The worst 5 of 193 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	259	ILE	N-CA-C	8.42	121.26	108.71
1	B	325	TRP	N-CA-C	8.27	122.37	109.96
1	K	306	GLN	N-CA-C	8.05	120.06	111.28
1	B	306	GLN	N-CA-C	8.01	119.64	111.07
1	D	259	ILE	N-CA-C	7.99	120.61	108.71

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	3404	0	3328	67	0
1	B	3404	0	3328	68	0
1	C	3404	0	3328	62	0
1	D	3404	0	3328	62	0
1	E	3404	0	3328	81	0
1	F	3404	0	3328	71	0
1	G	3404	0	3328	69	0
1	H	3404	0	3328	72	0
1	I	3404	0	3328	61	0
1	J	3404	0	3328	69	0
1	K	3404	0	3328	59	0
1	L	3404	0	3328	59	0
2	A	13	0	8	1	0
2	B	13	0	8	0	0
2	C	13	0	8	1	0
2	D	13	0	8	1	0
2	E	13	0	8	0	0
2	F	13	0	8	1	0
2	G	13	0	8	1	0
2	H	13	0	8	1	0
2	I	13	0	8	0	0
2	J	13	0	8	0	0
2	K	13	0	8	1	0
2	L	13	0	8	1	0
3	A	8	0	0	0	0
3	C	4	0	0	0	0
3	D	8	0	0	0	0
3	F	4	0	0	0	0
3	G	4	0	0	0	0
3	H	4	0	0	0	0
3	I	4	0	0	0	0
3	J	4	0	0	0	0
3	K	4	0	0	0	0
3	L	4	0	0	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	C	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	D	1	0	0	0	0
4	E	1	0	0	0	0
4	F	1	0	0	0	0
4	G	1	0	0	0	0
4	H	1	0	0	0	0
4	I	1	0	0	0	0
4	J	1	0	0	0	0
4	K	1	0	0	0	0
4	L	1	0	0	0	0
5	A	1	0	0	0	0
5	F	1	0	0	0	0
5	H	1	0	0	0	0
5	K	1	0	0	0	0
6	A	155	0	0	4	0
6	B	123	0	0	1	0
6	C	169	0	0	5	0
6	D	189	0	0	4	0
6	E	128	0	0	5	0
6	F	163	0	0	2	0
6	G	136	0	0	7	0
6	H	143	0	0	6	0
6	I	141	0	0	4	0
6	J	160	0	0	5	0
6	K	135	0	0	3	0
6	L	182	0	0	7	0
All	All	42892	0	40032	800	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 10.

The worst 5 of 800 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:F:333:ILE:HG22	1:F:337:MET:HE2	1.22	1.18
1:F:72:ARG:HH11	1:F:72:ARG:HB2	1.20	1.05
1:A:69:MET:HE2	1:A:73:GLU:HB3	1.45	0.98
1:G:127:GLN:HE21	1:G:127:GLN:HA	1.34	0.92
1:H:4:ASN:HB3	6:H:1604:HOH:O	1.72	0.90

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	411/427 (96%)	398 (97%)	10 (2%)	3 (1%)	18	15
1	B	411/427 (96%)	398 (97%)	10 (2%)	3 (1%)	18	15
1	C	411/427 (96%)	399 (97%)	10 (2%)	2 (0%)	24	22
1	D	411/427 (96%)	399 (97%)	10 (2%)	2 (0%)	24	22
1	E	411/427 (96%)	396 (96%)	12 (3%)	3 (1%)	18	15
1	F	411/427 (96%)	396 (96%)	14 (3%)	1 (0%)	43	44
1	G	411/427 (96%)	401 (98%)	8 (2%)	2 (0%)	24	22
1	H	411/427 (96%)	394 (96%)	15 (4%)	2 (0%)	24	22
1	I	411/427 (96%)	396 (96%)	13 (3%)	2 (0%)	24	22
1	J	411/427 (96%)	401 (98%)	8 (2%)	2 (0%)	24	22
1	K	411/427 (96%)	399 (97%)	10 (2%)	2 (0%)	24	22
1	L	411/427 (96%)	399 (97%)	10 (2%)	2 (0%)	24	22
All	All	4932/5124 (96%)	4776 (97%)	130 (3%)	26 (0%)	24	22

5 of 26 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	41	ASP
1	H	41	ASP
1	I	41	ASP
1	J	41	ASP
1	K	41	ASP

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	373/387 (96%)	368 (99%)	5 (1%)	61	69
1	B	373/387 (96%)	368 (99%)	5 (1%)	61	69
1	C	373/387 (96%)	368 (99%)	5 (1%)	61	69
1	D	373/387 (96%)	369 (99%)	4 (1%)	65	74
1	E	373/387 (96%)	366 (98%)	7 (2%)	50	58
1	F	373/387 (96%)	366 (98%)	7 (2%)	50	58
1	G	373/387 (96%)	368 (99%)	5 (1%)	61	69
1	H	373/387 (96%)	368 (99%)	5 (1%)	61	69
1	I	373/387 (96%)	369 (99%)	4 (1%)	65	74
1	J	373/387 (96%)	368 (99%)	5 (1%)	61	69
1	K	373/387 (96%)	369 (99%)	4 (1%)	65	74
1	L	373/387 (96%)	369 (99%)	4 (1%)	65	74
All	All	4476/4644 (96%)	4416 (99%)	60 (1%)	61	69

5 of 60 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	F	128	VAL
1	K	386	GLN
1	G	180	GLN
1	K	364	TYR
1	L	364	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 103 such sidechains are listed below:

Mol	Chain	Res	Type
1	F	293	ASN
1	H	330	ASN
1	L	202	GLN
1	G	18	ASN
1	H	20	GLN

5.3.3 RNA

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 oligosaccharides in this entry.

5.6 Ligand geometry (i)

Of 40 ligands modelled in this entry, 16 are monoatomic - leaving 24 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	REL	F	428	4	11,12,12	0.99	0	14,16,16	1.22	1 (7%)
2	REL	I	428	4	11,12,12	1.00	0	14,16,16	1.11	1 (7%)
2	REL	C	428	4	11,12,12	1.07	0	14,16,16	1.16	1 (7%)
2	REL	H	428	4	11,12,12	0.98	0	14,16,16	1.13	2 (14%)
3	CO3	D	430	-	3,3,3	0.79	0	2,3,3	0.13	0
2	REL	B	428	4	11,12,12	1.07	0	14,16,16	1.08	2 (14%)
2	REL	G	428	4	11,12,12	0.99	0	14,16,16	1.16	1 (7%)
3	CO3	C	429	-	3,3,3	0.78	0	2,3,3	0.06	0
3	CO3	G	429	-	3,3,3	0.85	0	2,3,3	0.17	0
3	CO3	L	429	-	3,3,3	0.80	0	2,3,3	0.04	0
3	CO3	F	429	-	3,3,3	0.87	0	2,3,3	0.06	0
2	REL	D	428	4	11,12,12	1.00	0	14,16,16	1.15	1 (7%)
3	CO3	J	429	-	3,3,3	0.99	0	2,3,3	0.20	0
3	CO3	A	429	-	3,3,3	1.06	0	2,3,3	0.18	0
2	REL	L	428	4	11,12,12	1.01	0	14,16,16	1.13	1 (7%)
3	CO3	D	429	-	3,3,3	0.93	0	2,3,3	0.13	0
3	CO3	K	429	-	3,3,3	0.84	0	2,3,3	0.26	0
2	REL	J	428	4	11,12,12	1.04	0	14,16,16	1.13	2 (14%)
2	REL	A	428	4	11,12,12	1.15	0	14,16,16	1.13	1 (7%)
2	REL	K	428	4	11,12,12	0.96	0	14,16,16	1.17	2 (14%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
2	REL	E	428	4	11,12,12	1.14	1 (9%)	14,16,16	1.15	2 (14%)
3	CO3	I	429	-	3,3,3	0.72	0	2,3,3	0.09	0
3	CO3	A	430	-	3,3,3	0.74	0	2,3,3	0.11	0
3	CO3	H	429	-	3,3,3	0.77	0	2,3,3	0.16	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	REL	L	428	4	-	10/17/18/18	-
2	REL	F	428	4	-	9/17/18/18	-
2	REL	K	428	4	-	10/17/18/18	-
2	REL	I	428	4	-	10/17/18/18	-
2	REL	C	428	4	-	11/17/18/18	-
2	REL	H	428	4	-	10/17/18/18	-
2	REL	J	428	4	-	11/17/18/18	-
2	REL	A	428	4	-	9/17/18/18	-
2	REL	D	428	4	-	9/17/18/18	-
2	REL	E	428	4	-	8/17/18/18	-
2	REL	B	428	4	-	9/17/18/18	-
2	REL	G	428	4	-	11/17/18/18	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	E	428	REL	C3-C2	2.02	1.56	1.53

The worst 5 of 17 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	F	428	REL	O6A-C6-C5	-2.38	115.28	121.62
2	J	428	REL	O6A-C6-C5	-2.37	115.30	121.62
2	K	428	REL	O6A-C6-C5	-2.37	115.32	121.62
2	E	428	REL	O6A-C6-C5	-2.34	115.39	121.62
2	H	428	REL	O6A-C6-C5	-2.32	115.43	121.62

There are no chirality outliers.

5 of 117 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	428	REL	O2-C2-C3-C4
2	A	428	REL	C1-C2-C3-C4
2	A	428	REL	O2-C2-C3-O3
2	A	428	REL	C1-C2-C3-O3
2	B	428	REL	O2-C2-C3-C4

There are no ring outliers.

8 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	F	428	REL	1	0
2	C	428	REL	1	0
2	H	428	REL	1	0
2	G	428	REL	1	0
2	D	428	REL	1	0
2	L	428	REL	1	0
2	A	428	REL	1	0
2	K	428	REL	1	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

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^{th} 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	413/427 (96%)	0.14	8 (1%)	66	69	18, 28, 47, 64	0
1	B	413/427 (96%)	0.37	22 (5%)	32	34	19, 30, 50, 65	0
1	C	413/427 (96%)	0.09	9 (2%)	62	65	17, 27, 43, 63	0
1	D	413/427 (96%)	-0.01	4 (0%)	79	81	15, 25, 42, 62	0
1	E	413/427 (96%)	0.34	19 (4%)	37	39	18, 29, 47, 65	0
1	F	413/427 (96%)	0.15	14 (3%)	48	50	18, 28, 46, 65	0
1	G	413/427 (96%)	0.12	10 (2%)	59	62	18, 28, 46, 64	0
1	H	413/427 (96%)	0.14	15 (3%)	46	48	17, 28, 47, 65	0
1	I	413/427 (96%)	0.17	10 (2%)	59	62	18, 28, 48, 64	0
1	J	413/427 (96%)	0.07	11 (2%)	56	59	16, 27, 43, 64	0
1	K	413/427 (96%)	0.16	16 (3%)	43	45	17, 27, 47, 62	0
1	L	413/427 (96%)	-0.06	9 (2%)	62	65	16, 25, 44, 62	0
All	All	4956/5124 (96%)	0.14	147 (2%)	52	55	15, 28, 46, 65	0

The worst 5 of 147 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	J	414	ARG	4.9
1	H	414	ARG	4.4
1	E	413	GLY	4.3
1	F	413	GLY	4.3
1	B	153	ILE	4.0

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 (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, 95^{th} 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(Å^2)	Q<0.9
2	REL	I	428	13/13	0.88	0.10	27,31,32,32	0
2	REL	B	428	13/13	0.89	0.10	29,31,34,34	0
2	REL	L	428	13/13	0.89	0.10	24,27,29,29	0
2	REL	A	428	13/13	0.90	0.09	28,31,32,32	0
2	REL	E	428	13/13	0.90	0.09	27,30,34,34	0
2	REL	J	428	13/13	0.91	0.09	25,28,31,31	0
2	REL	D	428	13/13	0.92	0.08	25,27,28,29	0
2	REL	F	428	13/13	0.92	0.08	25,28,31,31	0
2	REL	K	428	13/13	0.92	0.08	26,30,31,31	0
2	REL	H	428	13/13	0.92	0.07	25,31,33,33	0
2	REL	C	428	13/13	0.93	0.08	26,29,30,30	0
2	REL	G	428	13/13	0.94	0.07	25,27,29,29	0
3	CO3	A	429	4/4	0.94	0.07	23,24,25,27	0
3	CO3	C	429	4/4	0.94	0.07	22,22,23,24	0
3	CO3	F	429	4/4	0.94	0.07	24,25,26,29	0
3	CO3	I	429	4/4	0.96	0.07	23,24,26,26	0
3	CO3	A	430	4/4	0.97	0.05	21,22,23,25	0
3	CO3	H	429	4/4	0.97	0.05	24,25,25,25	0
3	CO3	D	429	4/4	0.97	0.05	18,20,21,21	0
3	CO3	K	429	4/4	0.97	0.04	20,22,22,23	0
3	CO3	L	429	4/4	0.97	0.05	19,20,23,25	0
3	CO3	D	430	4/4	0.98	0.04	20,20,21,24	0
4	ZN	E	429	1/1	0.98	0.03	27,27,27,27	0
3	CO3	J	429	4/4	0.99	0.04	18,18,20,22	0
4	ZN	A	431	1/1	0.99	0.02	27,27,27,27	0
4	ZN	B	429	1/1	0.99	0.05	36,36,36,36	0
4	ZN	C	430	1/1	0.99	0.02	26,26,26,26	0
4	ZN	D	431	1/1	0.99	0.03	21,21,21,21	0
3	CO3	G	429	4/4	0.99	0.04	19,21,22,22	0
4	ZN	F	430	1/1	0.99	0.04	30,30,30,30	0
4	ZN	I	430	1/1	0.99	0.04	32,32,32,32	0
4	ZN	K	430	1/1	0.99	0.02	29,29,29,29	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	ZN	L	430	1/1	0.99	0.02	24,24,24,24	0
5	CL	H	431	1/1	0.99	0.03	21,21,21,21	0
4	ZN	H	430	1/1	1.00	0.05	33,33,33,33	0
4	ZN	G	430	1/1	1.00	0.02	27,27,27,27	0
5	CL	A	432	1/1	1.00	0.03	23,23,23,23	0
5	CL	F	431	1/1	1.00	0.01	20,20,20,20	0
4	ZN	J	430	1/1	1.00	0.02	25,25,25,25	0
5	CL	K	431	1/1	1.00	0.02	21,21,21,21	0

6.5 Other polymers (i)

There are no such residues in this entry.