



wwPDB EM Validation Summary Report ⓘ

Dec 12, 2022 – 05:29 am GMT

PDB ID : 6YL3
EMDB ID : EMD-10835
Title : High resolution cryo-EM structure of urease from the pathogen *Yersinia enterocolitica*
Authors : Righetto, R.D.; Anton, L.; Adaixo, R.; Jakob, R.; Zivanov, J.; Mahi, M.A.; Ringler, P.; Schwede, T.; Maier, T.; Stahlberg, H.
Deposited on : 2020-04-06
Resolution : 1.98 Å(reported)

This is a wwPDB EM 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/EMValidationReportHelp>

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:

EMDB validation analysis : **FAILED**
Mogul : 1.8.4, CSD as541be (2020)
MolProbity : 4.02b-467
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : **FAILED**
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.31.3

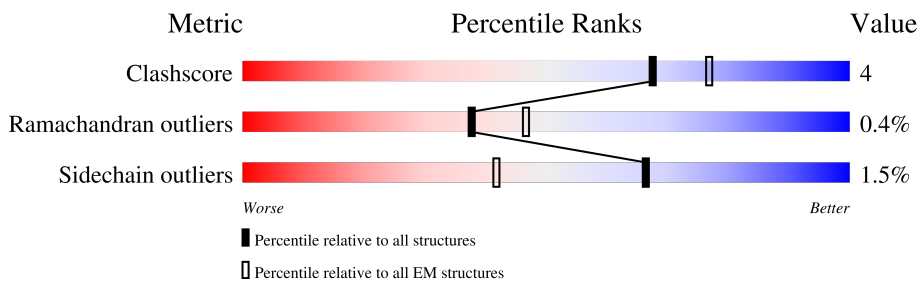
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 1.98 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)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the 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 $\leq 5\%$.

Mol	Chain	Length	Quality of chain
1	2	100	
1	5	100	
1	8	100	
1	A	100	
1	D	100	
1	G	100	
1	J	100	
1	M	100	
1	P	100	



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Mol	Chain	Length	Quality of chain	
1	S	100	45%	51%
1	W	100	47%	51%
1	Z	100	47%	52%
2	0	132	51%	46%
2	3	132	51%	45%
2	6	132	51%	46%
2	9	132	52%	45%
2	B	132	51%	47%
2	E	132	52%	46%
2	H	132	51%	47%
2	K	132	48%	49%
2	N	132	51%	46%
2	Q	132	52%	44%
2	T	132	51%	47%
2	X	132	52%	46%
3	1	571	48%	45%
3	4	571	48%	46%
3	7	571	48%	45%
3	C	571	48%	44%
3	F	571	48%	45%
3	I	571	48%	45%
3	L	571	47%	47%
3	O	571	48%	45%
3	R	571	47%	45%
3	U	571	48%	46%

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Mol	Chain	Length	Quality of chain
3	V	571	 48% 46% 5%
3	Y	571	 47% 46% 5%

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 150276 atoms, of which 73164 are hydrogens and 0 are deuteriums.

In the tables below, 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 Urease subunit gamma.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
1	A	100	1661	509	856	136	154	6	8	0
1	D	100	1661	509	856	136	154	6	8	0
1	G	100	1661	509	856	136	154	6	8	0
1	J	100	1661	509	856	136	154	6	8	0
1	M	100	1661	509	856	136	154	6	8	0
1	P	100	1661	509	856	136	154	6	8	0
1	S	100	1661	509	856	136	154	6	8	0
1	W	100	1661	509	856	136	154	6	8	0
1	Z	100	1661	509	856	136	154	6	8	0
1	2	100	1661	509	856	136	154	6	8	0
1	5	100	1661	509	856	136	154	6	8	0
1	8	100	1661	509	856	136	154	6	8	0

- Molecule 2 is a protein called Urease subunit beta.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
2	B	132	2061	654	1019	190	197	1	2	0
2	E	132	2061	654	1019	190	197	1	2	0
2	H	132	2061	654	1019	190	197	1	2	0

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Mol	Chain	Residues	Atoms					AltConf	Trace	
2	K	132	Total	C	H	N	O	S	2	0
			2061	654	1019	190	197	1		
2	N	132	Total	C	H	N	O	S	2	0
			2061	654	1019	190	197	1		
2	Q	132	Total	C	H	N	O	S	2	0
			2061	654	1019	190	197	1		
2	T	132	Total	C	H	N	O	S	2	0
			2061	654	1019	190	197	1		
2	X	132	Total	C	H	N	O	S	2	0
			2061	654	1019	190	197	1		
2	0	132	Total	C	H	N	O	S	2	0
			2061	654	1019	190	197	1		
2	3	132	Total	C	H	N	O	S	2	0
			2061	654	1019	190	197	1		
2	6	132	Total	C	H	N	O	S	2	0
			2061	654	1019	190	197	1		
2	9	132	Total	C	H	N	O	S	2	0
			2061	654	1019	190	197	1		

- Molecule 3 is a protein called Urease subunit alpha.

Mol	Chain	Residues	Atoms					AltConf	Trace	
3	C	564	Total	C	H	N	O	S	10	0
			8493	2669	4222	756	818	28		
3	F	564	Total	C	H	N	O	S	10	0
			8493	2669	4222	756	818	28		
3	I	564	Total	C	H	N	O	S	10	0
			8493	2669	4222	756	818	28		
3	L	564	Total	C	H	N	O	S	10	0
			8493	2669	4222	756	818	28		
3	O	564	Total	C	H	N	O	S	10	0
			8493	2669	4222	756	818	28		
3	R	564	Total	C	H	N	O	S	10	0
			8493	2669	4222	756	818	28		
3	V	564	Total	C	H	N	O	S	10	0
			8493	2669	4222	756	818	28		
3	Y	564	Total	C	H	N	O	S	10	0
			8493	2669	4222	756	818	28		
3	1	564	Total	C	H	N	O	S	10	0
			8493	2669	4222	756	818	28		
3	4	564	Total	C	H	N	O	S	10	0
			8493	2669	4222	756	818	28		

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Mol	Chain	Residues	Atoms					AltConf	Trace	
3	7	564	Total	C	H	N	O	S	10	0
			8493	2669	4222	756	818	28		
3	U	564	Total	C	H	N	O	S	10	0
			8493	2669	4222	756	818	28		

- Molecule 4 is NICKEL (II) ION (three-letter code: NI) (formula: Ni).

Mol	Chain	Residues	Atoms		AltConf
4	C	2	Total	Ni	0
			2	2	
4	F	2	Total	Ni	0
			2	2	
4	I	2	Total	Ni	0
			2	2	
4	L	2	Total	Ni	0
			2	2	
4	O	2	Total	Ni	0
			2	2	
4	R	2	Total	Ni	0
			2	2	
4	V	2	Total	Ni	0
			2	2	
4	Y	2	Total	Ni	0
			2	2	
4	1	2	Total	Ni	0
			2	2	
4	4	2	Total	Ni	0
			2	2	
4	7	2	Total	Ni	0
			2	2	
4	U	2	Total	Ni	0
			2	2	

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		AltConf
5	A	25	Total	O	0
			25	25	
5	B	59	Total	O	0
			59	59	
5	C	224	Total	O	0
			224	224	

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Mol	Chain	Residues	Atoms		AltConf
5	D	25	Total 25	O 25	0
5	E	59	Total 59	O 59	0
5	F	225	Total 225	O 225	0
5	G	27	Total 27	O 27	0
5	H	58	Total 58	O 58	0
5	I	227	Total 227	O 227	0
5	J	25	Total 25	O 25	0
5	K	59	Total 59	O 59	0
5	L	227	Total 227	O 227	0
5	M	25	Total 25	O 25	0
5	N	57	Total 57	O 57	0
5	O	222	Total 222	O 222	0
5	P	25	Total 25	O 25	0
5	Q	57	Total 57	O 57	0
5	R	216	Total 216	O 216	0
5	S	25	Total 25	O 25	0
5	T	58	Total 58	O 58	0
5	V	227	Total 227	O 227	0
5	W	25	Total 25	O 25	0
5	X	58	Total 58	O 58	0
5	Y	226	Total 226	O 226	0

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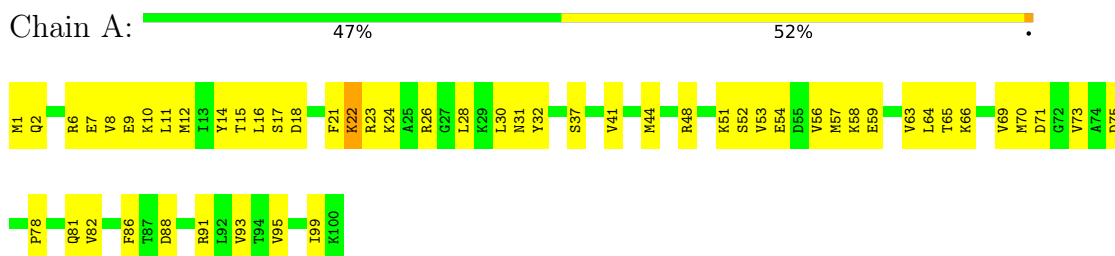
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Mol	Chain	Residues	Atoms		AltConf
5	Z	26	Total 26	O 26	0
5	0	57	Total 57	O 57	0
5	1	224	Total 224	O 224	0
5	2	25	Total 25	O 25	0
5	3	57	Total 57	O 57	0
5	4	216	Total 216	O 216	0
5	5	25	Total 25	O 25	0
5	6	57	Total 57	O 57	0
5	7	220	Total 220	O 220	0
5	8	25	Total 25	O 25	0
5	9	56	Total 56	O 56	0
5	U	223	Total 223	O 223	0

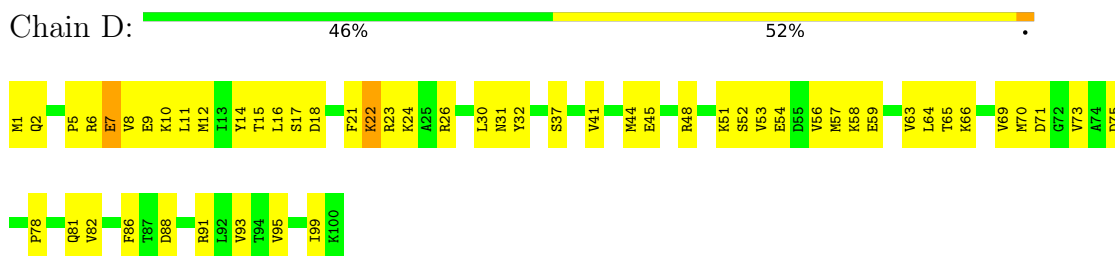
3 Residue-property plots [i](#)

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. 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. 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.

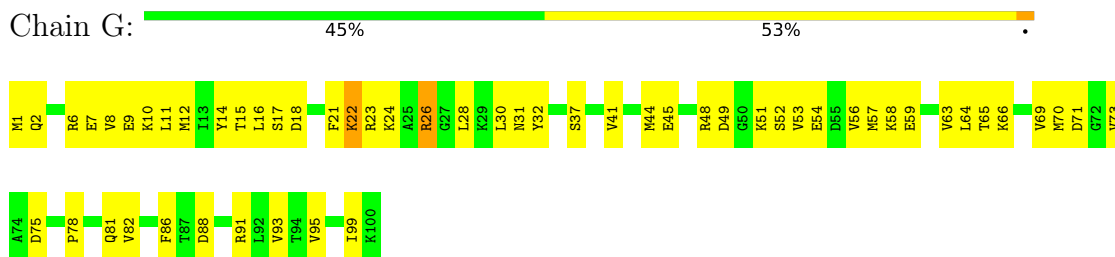
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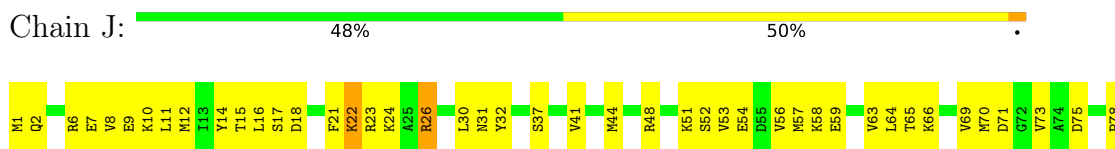
- Molecule 1: Urease subunit gamma

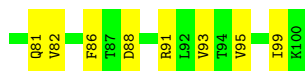


- Molecule 1: Urease subunit gamma

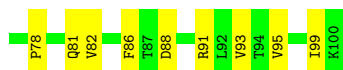


- Molecule 1: Urease subunit gamma





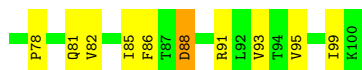
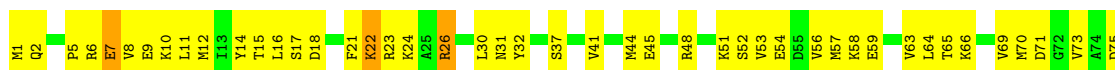
- Molecule 1: Urease subunit gamma



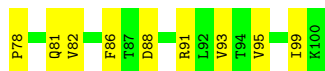
- Molecule 1: Urease subunit gamma



- Molecule 1: Urease subunit gamma

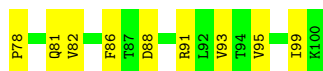


- Molecule 1: Urease subunit gamma



- Molecule 1: Urease subunit gamma

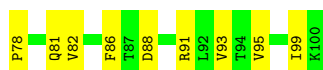




- Molecule 1: Urease subunit gamma



- Molecule 1: Urease subunit gamma



- Molecule 1: Urease subunit gamma



- Molecule 2: Urease subunit beta



- Molecule 2: Urease subunit beta





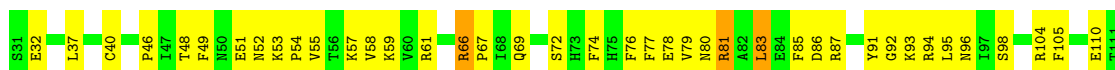
• Molecule 2: Urease subunit beta



• Molecule 2: Urease subunit beta



• Molecule 2: Urease subunit beta

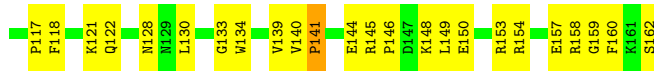


• Molecule 2: Urease subunit beta

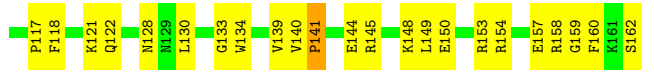
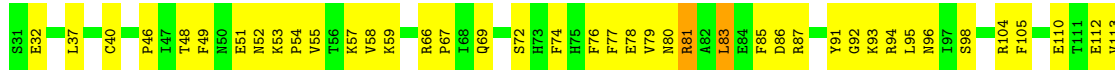


• Molecule 2: Urease subunit beta

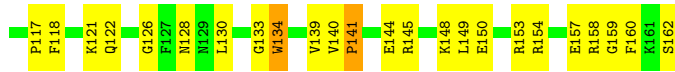
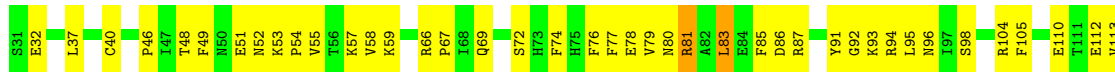




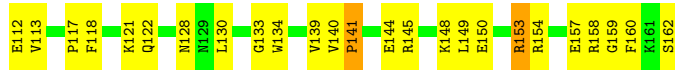
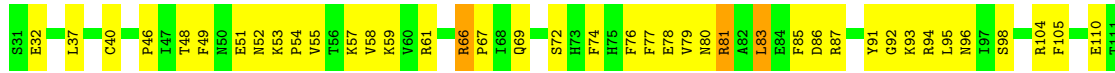
● Molecule 2: Urease subunit beta



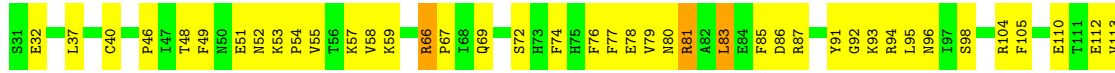
● Molecule 2: Urease subunit beta



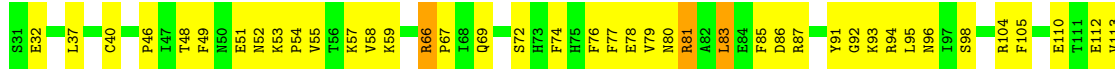
● Molecule 2: Urease subunit beta



● Molecule 2: Urease subunit beta

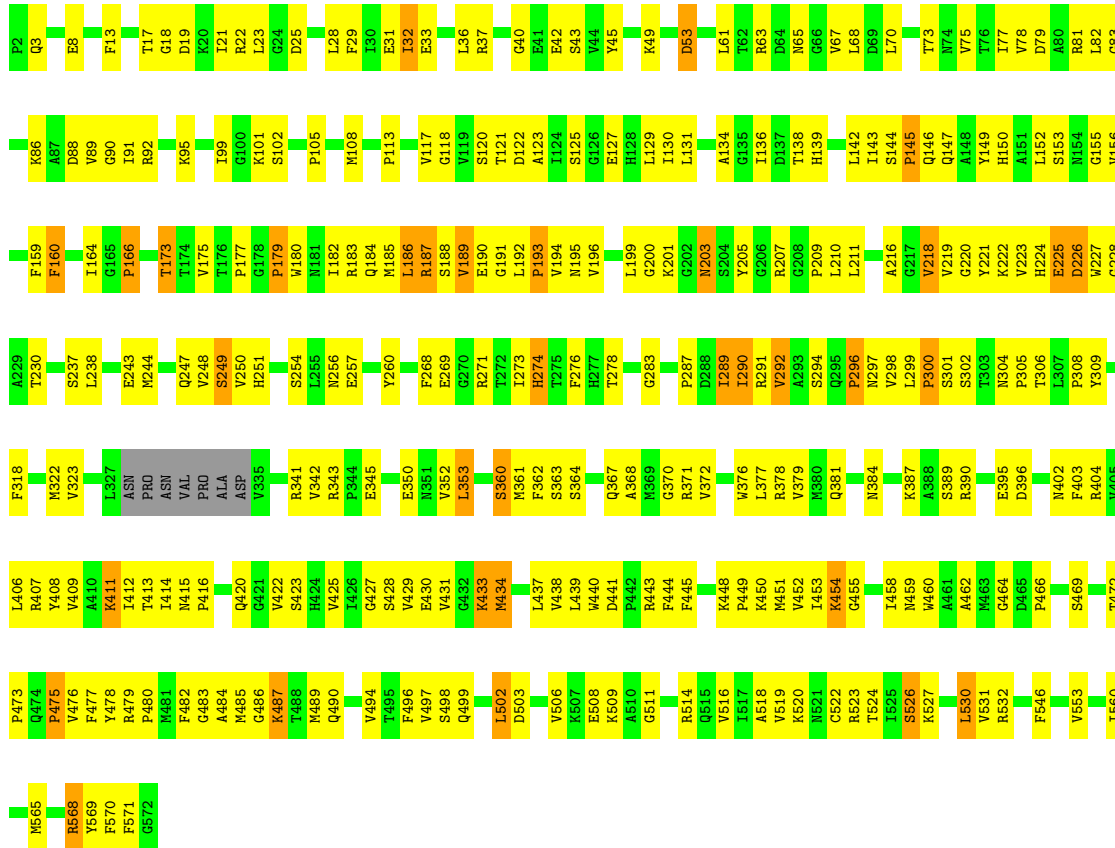


● Molecule 2: Urease subunit beta

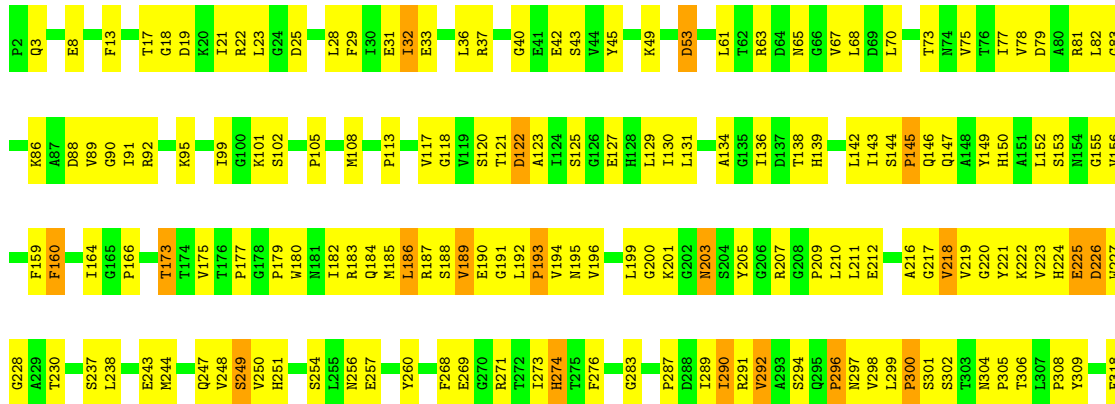


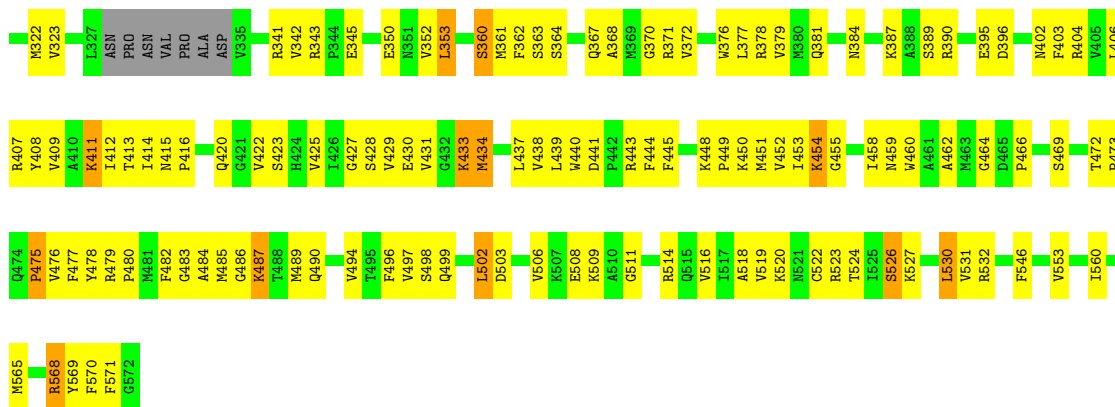


• Molecule 3: Urease subunit alpha

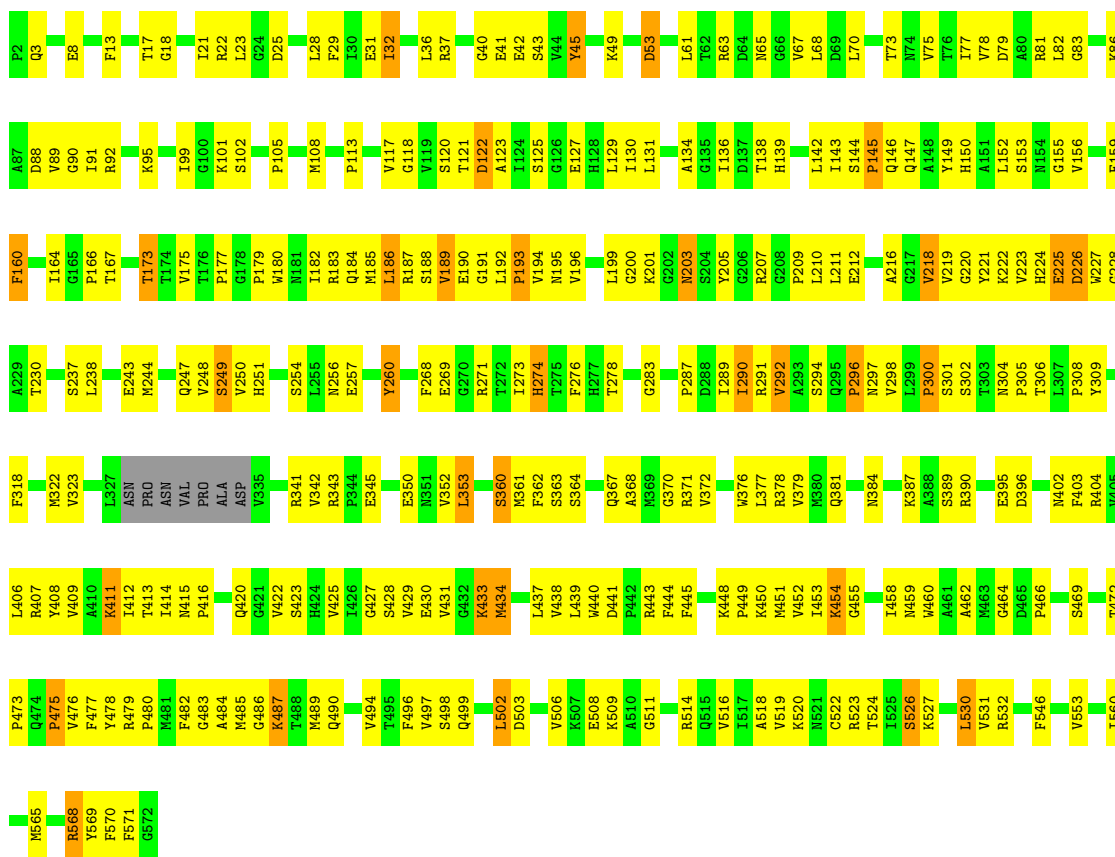


• Molecule 3: Urease subunit alpha



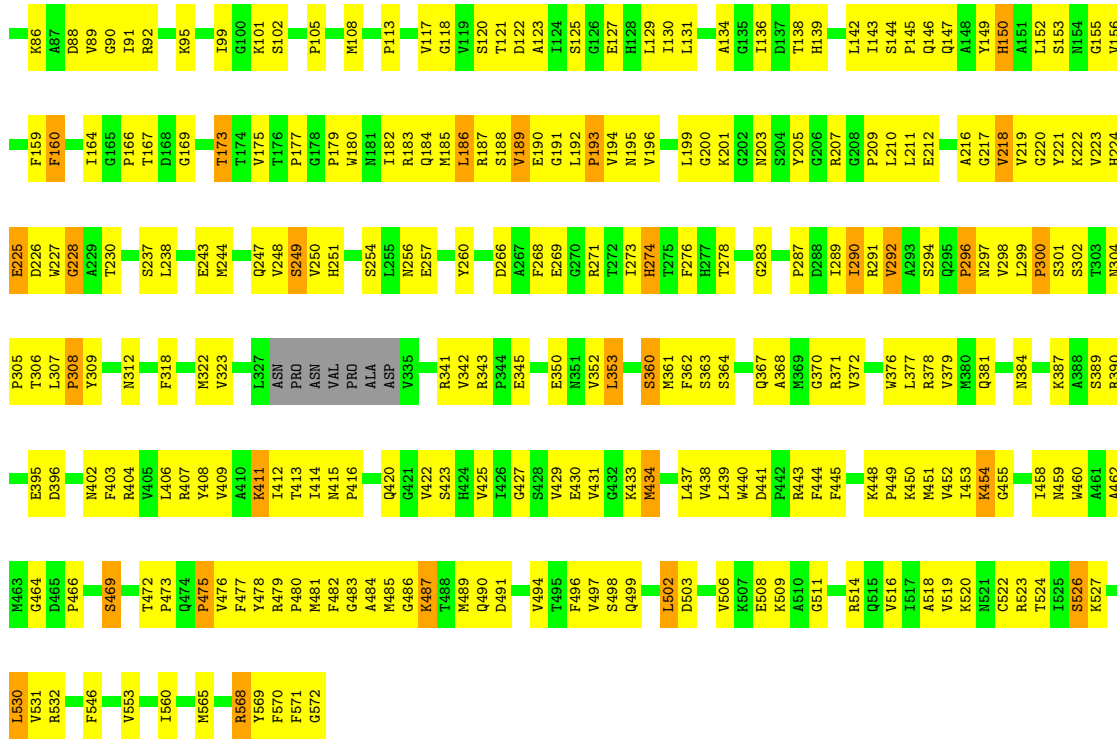


• Molecule 3: Urease subunit alpha



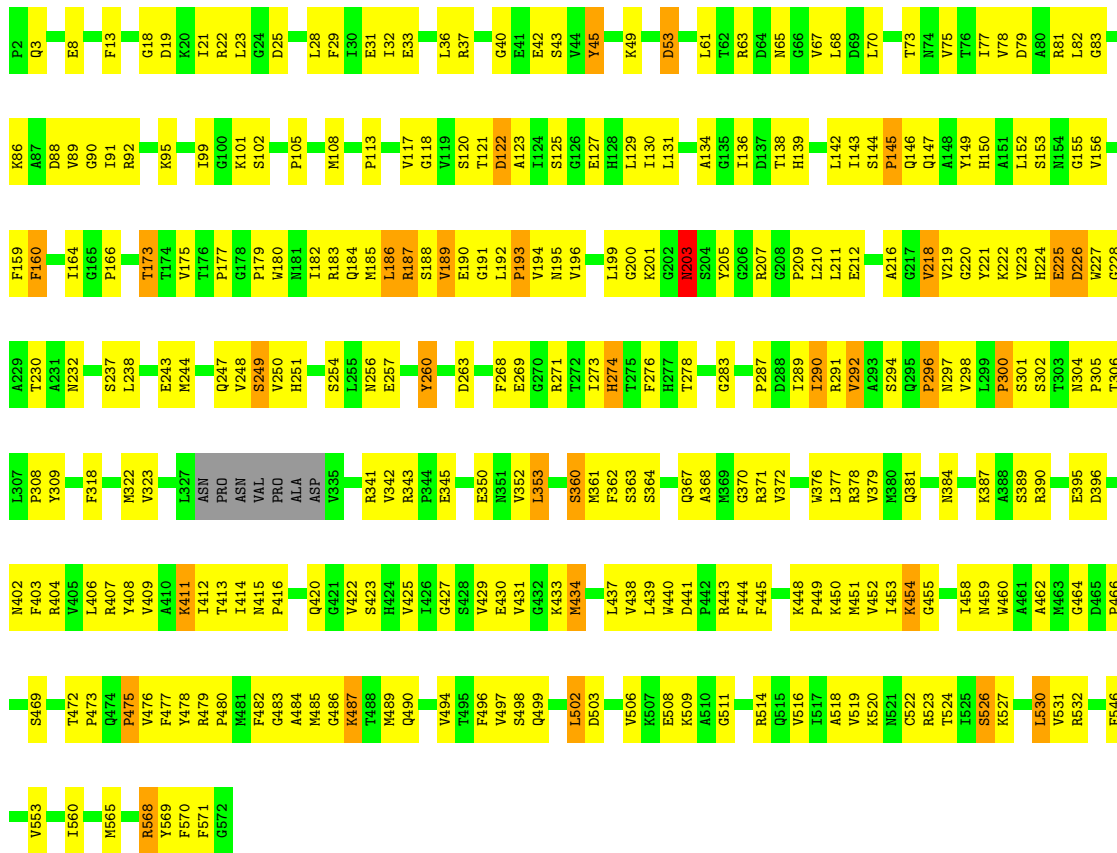
• Molecule 3: Urease subunit alpha





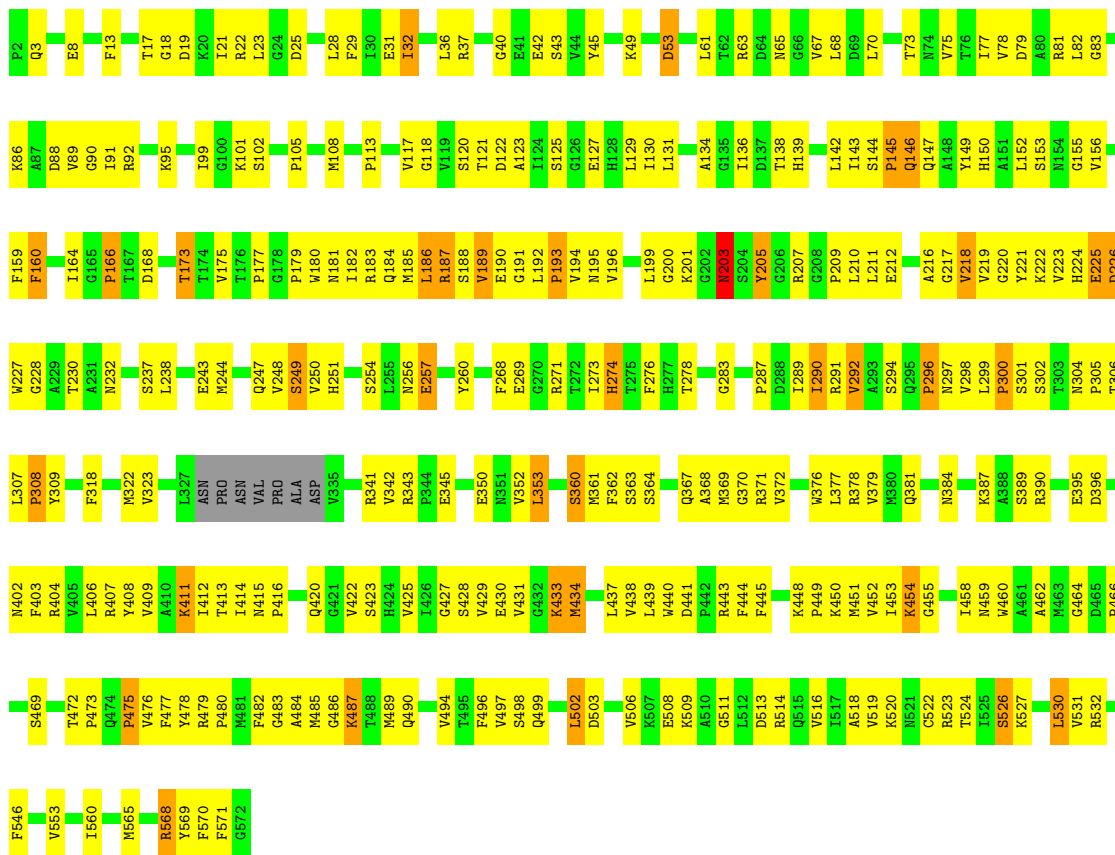
• Molecule 3: Urease subunit alpha

Chain O: 48% 45% 5%



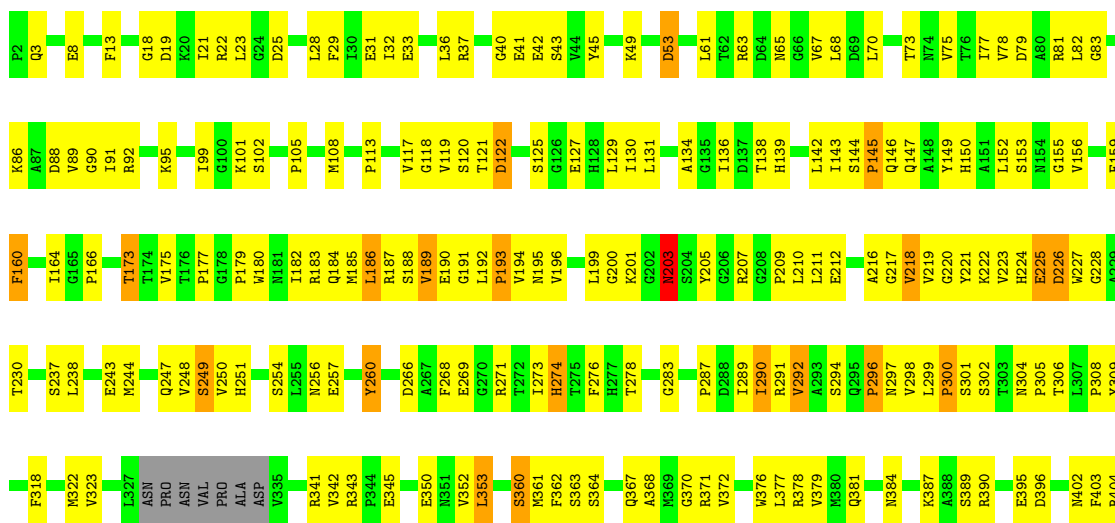
• Molecule 3: Urease subunit alpha

Chain R: 47% 45% 6%



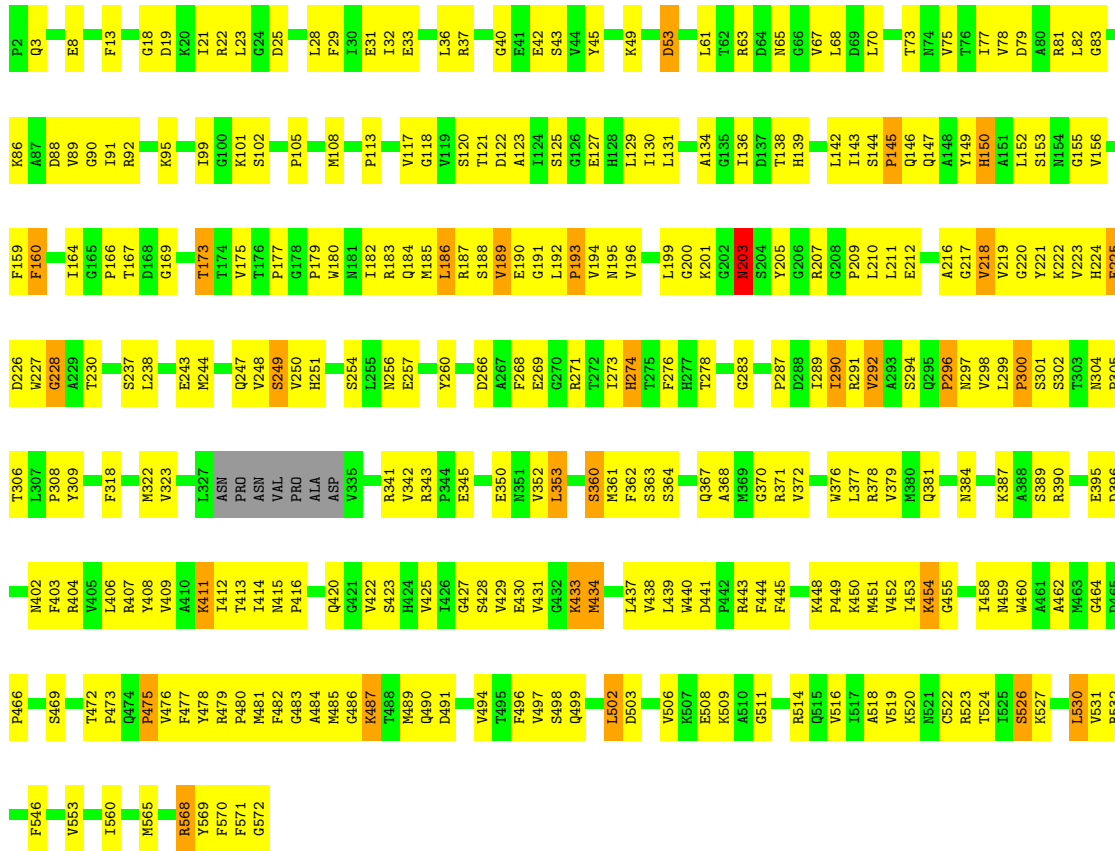
• Molecule 3: Urease subunit alpha

Chain V: 48% 46% 5%

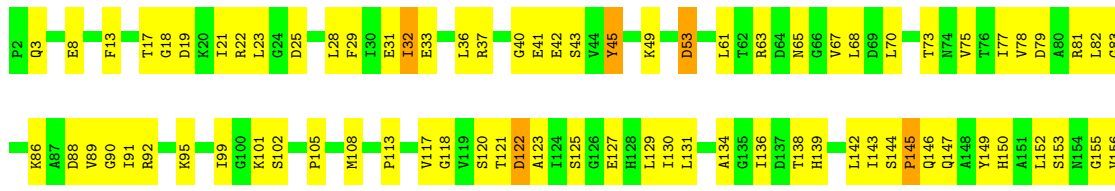


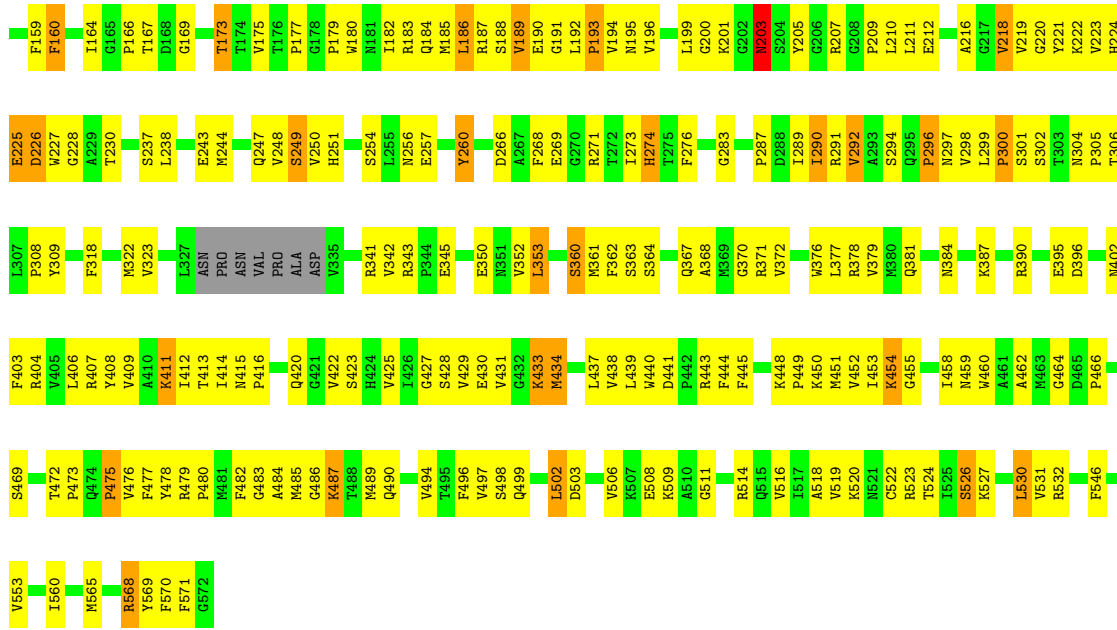


• Molecule 3: Urease subunit alpha

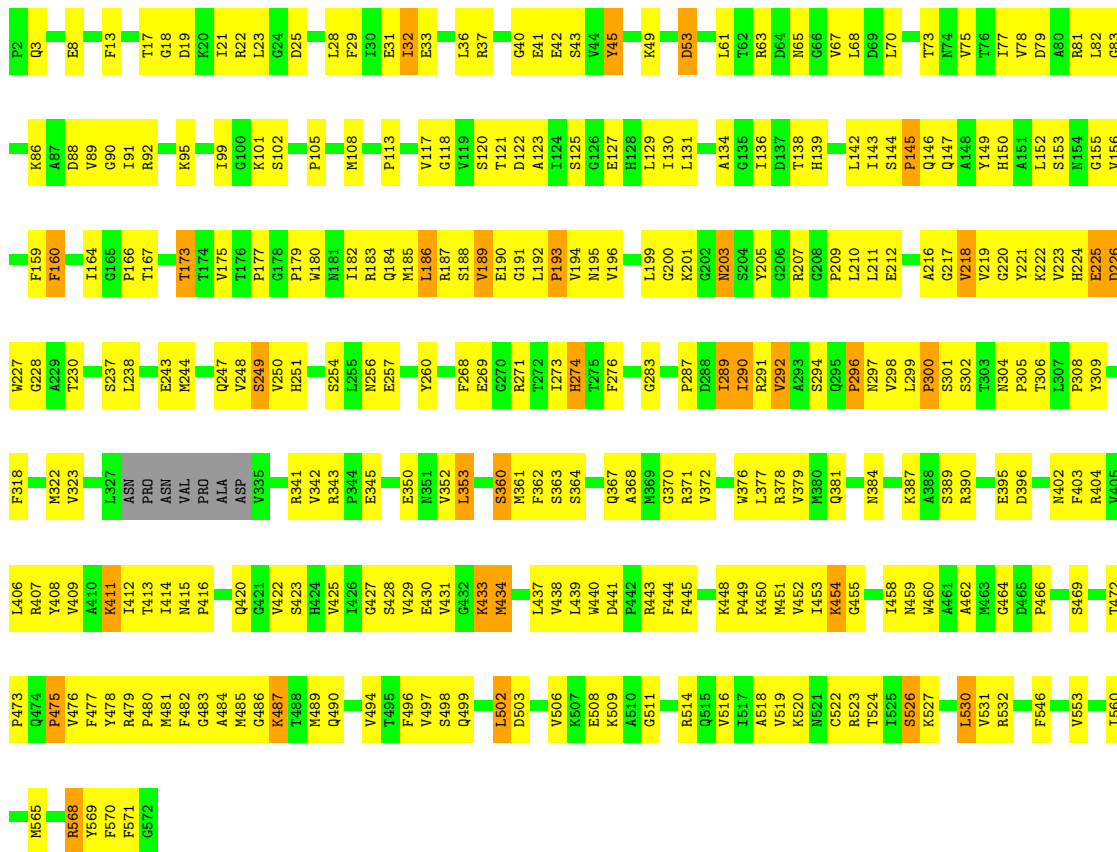


• Molecule 3: Urease subunit alpha

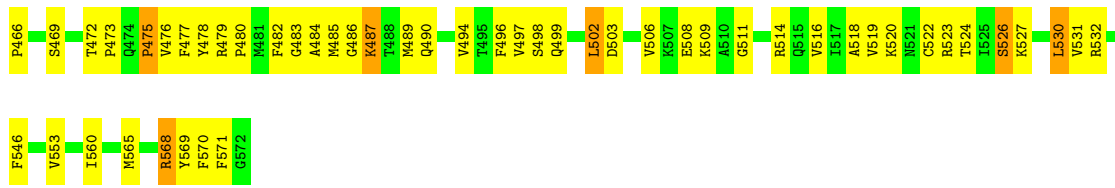




• Molecule 3: Urease subunit alpha



• Molecule 3: Urease subunit alpha



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, T	Depositor
Number of particles used	97627	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	42	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor

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: KCX, NI

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	2	2.72	69/844 (8.2%)	1.66	20/1135 (1.8%)
1	5	2.72	69/844 (8.2%)	1.66	20/1135 (1.8%)
1	8	2.72	70/844 (8.3%)	1.66	19/1135 (1.7%)
1	A	2.72	70/844 (8.3%)	1.66	20/1135 (1.8%)
1	D	2.72	70/844 (8.3%)	1.66	20/1135 (1.8%)
1	G	2.72	70/844 (8.3%)	1.66	19/1135 (1.7%)
1	J	2.72	70/844 (8.3%)	1.66	19/1135 (1.7%)
1	M	2.72	68/844 (8.1%)	1.66	20/1135 (1.8%)
1	P	2.72	69/844 (8.2%)	1.66	19/1135 (1.7%)
1	S	2.72	69/844 (8.2%)	1.66	20/1135 (1.8%)
1	W	2.72	69/844 (8.2%)	1.66	20/1135 (1.8%)
1	Z	2.72	69/844 (8.2%)	1.66	20/1135 (1.8%)
2	0	2.83	88/1076 (8.2%)	1.91	29/1455 (2.0%)
2	3	2.83	88/1076 (8.2%)	1.91	30/1455 (2.1%)
2	6	2.83	87/1076 (8.1%)	1.91	29/1455 (2.0%)
2	9	2.83	87/1076 (8.1%)	1.91	29/1455 (2.0%)
2	B	2.83	87/1076 (8.1%)	1.91	29/1455 (2.0%)
2	E	2.83	88/1076 (8.2%)	1.91	29/1455 (2.0%)
2	H	2.83	89/1076 (8.3%)	1.91	30/1455 (2.1%)
2	K	2.83	87/1076 (8.1%)	1.91	30/1455 (2.1%)
2	N	2.83	87/1076 (8.1%)	1.91	30/1455 (2.1%)
2	Q	2.83	87/1076 (8.1%)	1.91	29/1455 (2.0%)
2	T	2.83	87/1076 (8.1%)	1.91	29/1455 (2.0%)
2	X	2.83	88/1076 (8.2%)	1.91	29/1455 (2.0%)
3	1	2.99	405/4377 (9.3%)	1.91	135/5934 (2.3%)
3	4	2.99	407/4377 (9.3%)	1.91	136/5934 (2.3%)
3	7	2.99	402/4377 (9.2%)	1.91	135/5934 (2.3%)
3	C	2.97	403/4377 (9.2%)	1.91	136/5934 (2.3%)
3	F	2.99	407/4377 (9.3%)	1.91	138/5934 (2.3%)
3	I	2.99	405/4377 (9.3%)	1.91	132/5934 (2.2%)
3	L	2.99	405/4377 (9.3%)	1.91	135/5934 (2.3%)
3	O	2.99	406/4377 (9.3%)	1.91	137/5934 (2.3%)

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
3	R	2.99	408/4377 (9.3%)	1.91	135/5934 (2.3%)
3	U	2.99	406/4377 (9.3%)	1.91	136/5934 (2.3%)
3	V	2.99	408/4377 (9.3%)	1.91	137/5934 (2.3%)
3	Y	2.99	406/4377 (9.3%)	1.91	139/5934 (2.3%)
All	All	2.93	6750/75564 (8.9%)	1.88	2219/102288 (2.2%)

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	2	0	2
1	5	0	2
1	8	0	2
1	A	0	2
1	D	0	2
1	G	0	2
1	J	0	2
1	M	0	2
1	P	0	2
1	S	0	2
1	W	0	2
1	Z	0	2
3	1	0	1
3	4	0	1
3	7	0	1
3	C	0	1
3	F	0	1
3	I	0	1
3	L	0	1
3	O	0	1
3	R	0	1
3	U	0	1
3	V	0	1
3	Y	0	1
All	All	0	36

The worst 5 of 6750 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	R	212	GLU	CB-CG	-19.23	1.15	1.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	Y	212	GLU	CB-CG	-19.21	1.15	1.52
3	O	212	GLU	CB-CG	-19.21	1.15	1.52
3	4	212	GLU	CB-CG	-19.21	1.15	1.52
3	L	212	GLU	CB-CG	-19.21	1.15	1.52

The worst 5 of 2219 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	1	207	ARG	NE-CZ-NH1	15.14	127.87	120.30
3	L	207	ARG	NE-CZ-NH1	15.13	127.87	120.30
3	R	407[A]	ARG	NE-CZ-NH1	15.12	127.86	120.30
3	R	407[B]	ARG	NE-CZ-NH1	15.12	127.86	120.30
3	7	207	ARG	NE-CZ-NH1	15.12	127.86	120.30

There are no chirality outliers.

5 of 36 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	15	THR	Mainchain
3	C	287	PRO	Peptide
1	D	15	THR	Mainchain
3	F	287	PRO	Peptide
1	G	15	THR	Mainchain

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	2	805	856	818	8	0
1	5	805	856	818	4	0
1	8	805	856	818	6	0
1	A	805	856	818	3	0
1	D	805	856	818	5	0
1	G	805	856	818	6	0
1	J	805	856	818	3	0
1	M	805	856	818	3	0
1	P	805	856	818	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	S	805	856	818	10	0
1	W	805	856	818	4	0
1	Z	805	856	818	3	0
2	0	1042	1019	1008	9	0
2	3	1042	1019	1008	10	0
2	6	1042	1019	1008	8	0
2	9	1042	1019	1008	7	0
2	B	1042	1019	1008	7	0
2	E	1042	1019	1008	6	0
2	H	1042	1019	1008	6	0
2	K	1042	1019	1008	14	0
2	N	1042	1019	1008	7	0
2	Q	1042	1019	1008	11	0
2	T	1042	1019	1008	7	0
2	X	1042	1019	1008	6	0
3	1	4271	4222	4151	43	0
3	4	4271	4222	4151	40	0
3	7	4271	4222	4151	43	0
3	C	4271	4222	4151	41	0
3	F	4271	4222	4151	37	0
3	I	4271	4222	4151	40	0
3	L	4271	4222	4151	54	0
3	O	4271	4222	4152	43	0
3	R	4271	4222	4151	52	0
3	U	4271	4222	4152	41	0
3	V	4271	4222	4152	40	0
3	Y	4271	4222	4151	43	0
4	1	2	0	0	0	0
4	4	2	0	0	0	0
4	7	2	0	0	0	0
4	C	2	0	0	0	0
4	F	2	0	0	0	0
4	I	2	0	0	0	0
4	L	2	0	0	0	0
4	O	2	0	0	0	0
4	R	2	0	0	0	0
4	U	2	0	0	0	0
4	V	2	0	0	0	0
4	Y	2	0	0	0	0
5	0	57	0	0	2	0
5	1	224	0	0	6	0
5	2	25	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	3	57	0	0	2	0
5	4	216	0	0	5	0
5	5	25	0	0	0	0
5	6	57	0	0	3	0
5	7	220	0	0	6	0
5	8	25	0	0	0	0
5	9	56	0	0	2	0
5	A	25	0	0	0	0
5	B	59	0	0	2	0
5	C	224	0	0	6	0
5	D	25	0	0	0	0
5	E	59	0	0	2	0
5	F	225	0	0	5	0
5	G	27	0	0	0	0
5	H	58	0	0	3	0
5	I	227	0	0	7	0
5	J	25	0	0	0	0
5	K	59	0	0	2	0
5	L	227	0	0	9	0
5	M	25	0	0	0	0
5	N	57	0	0	6	0
5	O	222	0	0	7	0
5	P	25	0	0	0	0
5	Q	57	0	0	2	0
5	R	216	0	0	7	0
5	S	25	0	0	0	0
5	T	58	0	0	2	0
5	U	223	0	0	9	0
5	V	227	0	0	7	0
5	W	25	0	0	0	0
5	X	58	0	0	2	0
5	Y	226	0	0	7	0
5	Z	26	0	0	0	0
All	All	77112	73164	71727	565	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 4.

The worst 5 of 565 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)
2:9:141:PRO:N	2:9:141:PRO:CA	1.70	1.48
2:E:141:PRO:N	2:E:141:PRO:CA	1.70	1.47
2:6:141:PRO:N	2:6:141:PRO:CA	1.70	1.46
2:N:141:PRO:N	2:N:141:PRO:CA	1.70	1.45
2:X:141:PRO:N	2:X:141:PRO:CA	1.70	1.44

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 PDB entries followed by that with respect to all EM entries.

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	2	106/100 (106%)	103 (97%)	3 (3%)	0	100	100
1	5	106/100 (106%)	103 (97%)	3 (3%)	0	100	100
1	8	106/100 (106%)	103 (97%)	3 (3%)	0	100	100
1	A	106/100 (106%)	103 (97%)	3 (3%)	0	100	100
1	D	106/100 (106%)	103 (97%)	3 (3%)	0	100	100
1	G	106/100 (106%)	103 (97%)	3 (3%)	0	100	100
1	J	106/100 (106%)	103 (97%)	3 (3%)	0	100	100
1	M	106/100 (106%)	103 (97%)	3 (3%)	0	100	100
1	P	106/100 (106%)	103 (97%)	3 (3%)	0	100	100
1	S	106/100 (106%)	103 (97%)	3 (3%)	0	100	100
1	W	106/100 (106%)	103 (97%)	3 (3%)	0	100	100
1	Z	106/100 (106%)	103 (97%)	3 (3%)	0	100	100
2	0	132/132 (100%)	120 (91%)	9 (7%)	3 (2%)	6	1
2	3	132/132 (100%)	120 (91%)	9 (7%)	3 (2%)	6	1
2	6	132/132 (100%)	120 (91%)	9 (7%)	3 (2%)	6	1
2	9	132/132 (100%)	120 (91%)	9 (7%)	3 (2%)	6	1

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	B	132/132 (100%)	120 (91%)	9 (7%)	3 (2%)	6	1
2	E	132/132 (100%)	120 (91%)	9 (7%)	3 (2%)	6	1
2	H	132/132 (100%)	120 (91%)	9 (7%)	3 (2%)	6	1
2	K	132/132 (100%)	120 (91%)	9 (7%)	3 (2%)	6	1
2	N	132/132 (100%)	120 (91%)	9 (7%)	3 (2%)	6	1
2	Q	132/132 (100%)	120 (91%)	9 (7%)	3 (2%)	6	1
2	T	132/132 (100%)	120 (91%)	9 (7%)	3 (2%)	6	1
2	X	132/132 (100%)	120 (91%)	9 (7%)	3 (2%)	6	1
3	1	569/571 (100%)	536 (94%)	33 (6%)	0	100	100
3	4	569/571 (100%)	537 (94%)	32 (6%)	0	100	100
3	7	569/571 (100%)	537 (94%)	32 (6%)	0	100	100
3	C	569/571 (100%)	538 (95%)	31 (5%)	0	100	100
3	F	569/571 (100%)	537 (94%)	32 (6%)	0	100	100
3	I	569/571 (100%)	536 (94%)	33 (6%)	0	100	100
3	L	569/571 (100%)	537 (94%)	32 (6%)	0	100	100
3	O	569/571 (100%)	536 (94%)	33 (6%)	0	100	100
3	R	569/571 (100%)	537 (94%)	32 (6%)	0	100	100
3	U	569/571 (100%)	536 (94%)	33 (6%)	0	100	100
3	V	569/571 (100%)	537 (94%)	32 (6%)	0	100	100
3	Y	569/571 (100%)	537 (94%)	32 (6%)	0	100	100
All	All	9684/9636 (100%)	9117 (94%)	531 (6%)	36 (0%)	38	22

5 of 36 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	32	GLU
2	E	32	GLU
2	H	32	GLU
2	K	32	GLU
2	N	32	GLU

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 PDB entries followed by that with respect to all EM

entries.

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	2	95/87 (109%)	92 (97%)	3 (3%)	39	28
1	5	95/87 (109%)	92 (97%)	3 (3%)	39	28
1	8	95/87 (109%)	92 (97%)	3 (3%)	39	28
1	A	95/87 (109%)	92 (97%)	3 (3%)	39	28
1	D	95/87 (109%)	92 (97%)	3 (3%)	39	28
1	G	95/87 (109%)	92 (97%)	3 (3%)	39	28
1	J	95/87 (109%)	92 (97%)	3 (3%)	39	28
1	M	95/87 (109%)	92 (97%)	3 (3%)	39	28
1	P	95/87 (109%)	92 (97%)	3 (3%)	39	28
1	S	95/87 (109%)	92 (97%)	3 (3%)	39	28
1	W	95/87 (109%)	92 (97%)	3 (3%)	39	28
1	Z	95/87 (109%)	92 (97%)	3 (3%)	39	28
2	0	112/110 (102%)	109 (97%)	3 (3%)	44	35
2	3	112/110 (102%)	109 (97%)	3 (3%)	44	35
2	6	112/110 (102%)	109 (97%)	3 (3%)	44	35
2	9	112/110 (102%)	109 (97%)	3 (3%)	44	35
2	B	112/110 (102%)	109 (97%)	3 (3%)	44	35
2	E	112/110 (102%)	109 (97%)	3 (3%)	44	35
2	H	112/110 (102%)	109 (97%)	3 (3%)	44	35
2	K	112/110 (102%)	109 (97%)	3 (3%)	44	35
2	N	112/110 (102%)	109 (97%)	3 (3%)	44	35
2	Q	112/110 (102%)	109 (97%)	3 (3%)	44	35
2	T	112/110 (102%)	109 (97%)	3 (3%)	44	35
2	X	112/110 (102%)	109 (97%)	3 (3%)	44	35
3	1	458/456 (100%)	452 (99%)	6 (1%)	69	64
3	4	458/456 (100%)	452 (99%)	6 (1%)	69	64
3	7	458/456 (100%)	452 (99%)	6 (1%)	69	64
3	C	458/456 (100%)	452 (99%)	6 (1%)	69	64
3	F	458/456 (100%)	452 (99%)	6 (1%)	69	64

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
3	I	458/456 (100%)	452 (99%)	6 (1%)	69	64
3	L	458/456 (100%)	452 (99%)	6 (1%)	69	64
3	O	458/456 (100%)	452 (99%)	6 (1%)	69	64
3	R	458/456 (100%)	452 (99%)	6 (1%)	69	64
3	U	458/456 (100%)	452 (99%)	6 (1%)	69	64
3	V	458/456 (100%)	452 (99%)	6 (1%)	69	64
3	Y	458/456 (100%)	452 (99%)	6 (1%)	69	64
All	All	7980/7836 (102%)	7836 (98%)	144 (2%)	66	51

5 of 144 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	4	37	ARG
3	U	454	LYS
3	4	454	LYS
3	7	434[B]	MET
1	M	16[A]	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 39 such sidechains are listed below:

Mol	Chain	Res	Type
3	1	60	HIS
3	7	528	HIS
3	1	528	HIS
3	4	528	HIS
3	U	60	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](#)

12 non-standard protein/DNA/RNA residues are modelled in this entry.

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
3	KCX	V	222	3,4	9,11,12	1.46	2 (22%)	5,12,14	1.13	0
3	KCX	7	222	3,4	9,11,12	1.46	2 (22%)	5,12,14	1.13	0
3	KCX	C	222	3,4	9,11,12	1.67	3 (33%)	5,12,14	2.65	1 (20%)
3	KCX	O	222	3,4	9,11,12	1.66	3 (33%)	5,12,14	2.66	1 (20%)
3	KCX	F	222	3,4	9,11,12	1.46	2 (22%)	5,12,14	1.12	0
3	KCX	U	222	3,4	9,11,12	1.67	3 (33%)	5,12,14	2.64	1 (20%)
3	KCX	I	222	3,4	9,11,12	1.66	3 (33%)	5,12,14	2.65	1 (20%)
3	KCX	Y	222	3,4	9,11,12	1.66	3 (33%)	5,12,14	2.65	1 (20%)
3	KCX	L	222	3,4	9,11,12	1.65	3 (33%)	5,12,14	2.66	1 (20%)
3	KCX	R	222	3,4	9,11,12	1.66	3 (33%)	5,12,14	2.65	1 (20%)
3	KCX	1	222	3,4	9,11,12	1.67	3 (33%)	5,12,14	2.66	1 (20%)
3	KCX	4	222	3,4	9,11,12	1.66	3 (33%)	5,12,14	2.66	1 (20%)

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
3	KCX	V	222	3,4	-	0/9/10/12	-
3	KCX	7	222	3,4	-	0/9/10/12	-
3	KCX	C	222	3,4	-	0/9/10/12	-
3	KCX	O	222	3,4	-	0/9/10/12	-
3	KCX	F	222	3,4	-	0/9/10/12	-
3	KCX	U	222	3,4	-	0/9/10/12	-
3	KCX	I	222	3,4	-	0/9/10/12	-
3	KCX	Y	222	3,4	-	0/9/10/12	-
3	KCX	L	222	3,4	-	0/9/10/12	-
3	KCX	R	222	3,4	-	0/9/10/12	-
3	KCX	1	222	3,4	-	0/9/10/12	-
3	KCX	4	222	3,4	-	0/9/10/12	-

The worst 5 of 33 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	1	222	KCX	OQ1-CX	2.97	1.27	1.21
3	C	222	KCX	OQ1-CX	2.94	1.27	1.21
3	I	222	KCX	OQ1-CX	2.93	1.27	1.21
3	4	222	KCX	OQ1-CX	2.93	1.27	1.21
3	L	222	KCX	OQ1-CX	2.92	1.27	1.21

The worst 5 of 9 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	L	222	KCX	OQ1-CX-NZ	-5.53	116.39	124.96
3	4	222	KCX	OQ1-CX-NZ	-5.53	116.39	124.96
3	O	222	KCX	OQ1-CX-NZ	-5.53	116.39	124.96
3	1	222	KCX	OQ1-CX-NZ	-5.52	116.40	124.96
3	Y	222	KCX	OQ1-CX-NZ	-5.51	116.41	124.96

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 24 ligands modelled in this entry, 24 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

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

The following chains have linkage breaks:

Mol	Chain	Number of breaks
3	I	7
3	O	7
3	V	7
3	1	7
3	U	7
3	7	6
3	C	6
3	F	6
3	L	6
3	R	6
3	Y	6
3	4	6
2	B	3
2	E	3
2	H	3
2	K	3
2	N	3
2	Q	3
2	T	3
2	X	3
2	0	3
2	3	3
2	6	3
2	9	3

The worst 5 of 113 chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	I	156:VAL	C	157:ALA	N	1.20
1	O	156:VAL	C	157:ALA	N	1.20
1	V	156:VAL	C	157:ALA	N	1.20
1	1	156:VAL	C	157:ALA	N	1.20
1	U	156:VAL	C	157:ALA	N	1.20