



# wwPDB X-ray Structure Validation Summary Report ⓘ

Sep 16, 2023 – 09:59 PM EDT

PDB ID : 4WL1  
Title : Structure of WzzE Polysaccharide Co-polymerase  
Authors : Kalynych, S.; Cherney, M.; Cygler, M.  
Deposited on : 2014-10-05  
Resolution : 5.99 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](mailto: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>.

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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  
Xtriage (Phenix) : 1.13  
EDS : 2.35.1  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.35.1

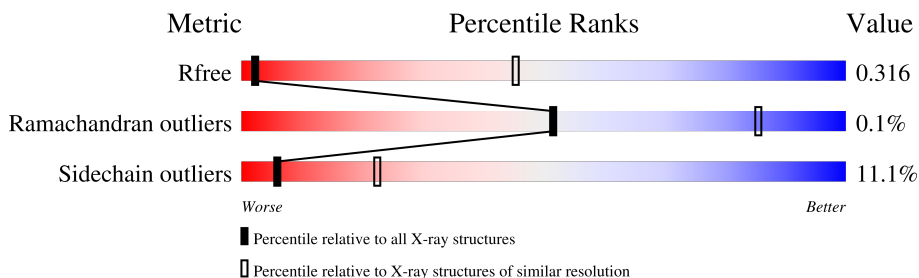
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 5.99 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))
$R_{free}$	130704	1000 (8.00-3.88)
Ramachandran outliers	138981	1016 (8.00-3.86)
Sidechain outliers	138945	1017 (8.00-3.82)

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  $\geq 3$ , 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	A	356	
1	B	356	
1	C	356	
1	D	356	
1	E	356	
1	F	356	
1	G	356	
1	H	356	

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Mol	Chain	Length	Quality of chain
1	I	356	53% 7% 38%
1	J	356	54% 6% 38%
1	K	356	54% 7% 38%
1	L	356	53% 7% 38%
1	M	356	53% 6% 38%
1	N	356	56% 3% 38%
1	O	356	56% 3% 38%
1	P	356	53% 6% 38%
1	Q	356	55% 5% 38%
1	R	356	54% 6% 38%
1	S	356	54% 5% 38%
1	T	356	53% 7% 38%
1	U	356	53% 8% 38%
1	V	356	56% 5% 38%
1	W	356	54% 6% 38%
1	X	356	53% 8% 38%
1	Y	356	52% 8% 38%
1	Z	356	54% 6% 38%
1	a	356	54% 6% 38%
1	b	356	53% 6% 38%
1	c	356	54% 6% 38%
1	d	356	55% 3% 38%
1	e	356	53% 6% 38%
1	f	356	53% 5% 38%

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 57504 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 Lipopolysaccharide biosynthesis protein WzzE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	221	Total 1797	C 1124	N 321	O 344	S 8	0	0	0
1	B	221	Total 1797	C 1124	N 321	O 344	S 8	0	0	0
1	C	221	Total 1797	C 1124	N 321	O 344	S 8	0	0	0
1	D	221	Total 1797	C 1124	N 321	O 344	S 8	0	0	0
1	E	221	Total 1797	C 1124	N 321	O 344	S 8	0	0	0
1	F	221	Total 1797	C 1124	N 321	O 344	S 8	0	0	0
1	G	221	Total 1797	C 1124	N 321	O 344	S 8	0	0	0
1	H	221	Total 1797	C 1124	N 321	O 344	S 8	0	0	0
1	I	221	Total 1797	C 1124	N 321	O 344	S 8	0	0	0
1	J	221	Total 1797	C 1124	N 321	O 344	S 8	0	0	0
1	K	221	Total 1797	C 1124	N 321	O 344	S 8	0	0	0
1	L	221	Total 1797	C 1124	N 321	O 344	S 8	0	0	0
1	M	221	Total 1797	C 1124	N 321	O 344	S 8	0	0	0
1	N	221	Total 1797	C 1124	N 321	O 344	S 8	0	0	0
1	O	221	Total 1797	C 1124	N 321	O 344	S 8	0	0	0
1	P	221	Total 1797	C 1124	N 321	O 344	S 8	0	0	0

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	Q	221	Total	C	N	O	S	0	0	0
			1797	1124	321	344	8			
1	R	221	Total	C	N	O	S	0	0	0
			1797	1124	321	344	8			
1	S	221	Total	C	N	O	S	0	0	0
			1797	1124	321	344	8			
1	T	221	Total	C	N	O	S	0	0	0
			1797	1124	321	344	8			
1	U	221	Total	C	N	O	S	0	0	0
			1797	1124	321	344	8			
1	V	221	Total	C	N	O	S	0	0	0
			1797	1124	321	344	8			
1	W	221	Total	C	N	O	S	0	0	0
			1797	1124	321	344	8			
1	X	221	Total	C	N	O	S	0	0	0
			1797	1124	321	344	8			
1	Y	221	Total	C	N	O	S	0	0	0
			1797	1124	321	344	8			
1	Z	221	Total	C	N	O	S	0	0	0
			1797	1124	321	344	8			
1	a	221	Total	C	N	O	S	0	0	0
			1797	1124	321	344	8			
1	b	221	Total	C	N	O	S	0	0	0
			1797	1124	321	344	8			
1	c	221	Total	C	N	O	S	0	0	0
			1797	1124	321	344	8			
1	d	221	Total	C	N	O	S	0	0	0
			1797	1124	321	344	8			
1	e	221	Total	C	N	O	S	0	0	0
			1797	1124	321	344	8			
1	f	221	Total	C	N	O	S	0	0	0
			1797	1124	321	344	8			

There are 288 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-6	MET	-	initiating methionine	UNP P0AG01
A	-5	GLY	-	expression tag	UNP P0AG01
A	-4	SER	-	expression tag	UNP P0AG01
A	-3	HIS	-	expression tag	UNP P0AG01
A	-2	HIS	-	expression tag	UNP P0AG01
A	-1	HIS	-	expression tag	UNP P0AG01
A	0	HIS	-	expression tag	UNP P0AG01

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Chain	Residue	Modelled	Actual	Comment	Reference
A	1	HIS	-	expression tag	UNP P0AG01
A	2	HIS	-	expression tag	UNP P0AG01
B	-6	MET	-	initiating methionine	UNP P0AG01
B	-5	GLY	-	expression tag	UNP P0AG01
B	-4	SER	-	expression tag	UNP P0AG01
B	-3	HIS	-	expression tag	UNP P0AG01
B	-2	HIS	-	expression tag	UNP P0AG01
B	-1	HIS	-	expression tag	UNP P0AG01
B	0	HIS	-	expression tag	UNP P0AG01
B	1	HIS	-	expression tag	UNP P0AG01
B	2	HIS	-	expression tag	UNP P0AG01
C	-6	MET	-	initiating methionine	UNP P0AG01
C	-5	GLY	-	expression tag	UNP P0AG01
C	-4	SER	-	expression tag	UNP P0AG01
C	-3	HIS	-	expression tag	UNP P0AG01
C	-2	HIS	-	expression tag	UNP P0AG01
C	-1	HIS	-	expression tag	UNP P0AG01
C	0	HIS	-	expression tag	UNP P0AG01
C	1	HIS	-	expression tag	UNP P0AG01
C	2	HIS	-	expression tag	UNP P0AG01
D	-6	MET	-	initiating methionine	UNP P0AG01
D	-5	GLY	-	expression tag	UNP P0AG01
D	-4	SER	-	expression tag	UNP P0AG01
D	-3	HIS	-	expression tag	UNP P0AG01
D	-2	HIS	-	expression tag	UNP P0AG01
D	-1	HIS	-	expression tag	UNP P0AG01
D	0	HIS	-	expression tag	UNP P0AG01
D	1	HIS	-	expression tag	UNP P0AG01
D	2	HIS	-	expression tag	UNP P0AG01
E	-6	MET	-	initiating methionine	UNP P0AG01
E	-5	GLY	-	expression tag	UNP P0AG01
E	-4	SER	-	expression tag	UNP P0AG01
E	-3	HIS	-	expression tag	UNP P0AG01
E	-2	HIS	-	expression tag	UNP P0AG01
E	-1	HIS	-	expression tag	UNP P0AG01
E	0	HIS	-	expression tag	UNP P0AG01
E	1	HIS	-	expression tag	UNP P0AG01
E	2	HIS	-	expression tag	UNP P0AG01
F	-6	MET	-	initiating methionine	UNP P0AG01
F	-5	GLY	-	expression tag	UNP P0AG01
F	-4	SER	-	expression tag	UNP P0AG01
F	-3	HIS	-	expression tag	UNP P0AG01

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Chain	Residue	Modelled	Actual	Comment	Reference
F	-2	HIS	-	expression tag	UNP P0AG01
F	-1	HIS	-	expression tag	UNP P0AG01
F	0	HIS	-	expression tag	UNP P0AG01
F	1	HIS	-	expression tag	UNP P0AG01
F	2	HIS	-	expression tag	UNP P0AG01
G	-6	MET	-	initiating methionine	UNP P0AG01
G	-5	GLY	-	expression tag	UNP P0AG01
G	-4	SER	-	expression tag	UNP P0AG01
G	-3	HIS	-	expression tag	UNP P0AG01
G	-2	HIS	-	expression tag	UNP P0AG01
G	-1	HIS	-	expression tag	UNP P0AG01
G	0	HIS	-	expression tag	UNP P0AG01
G	1	HIS	-	expression tag	UNP P0AG01
G	2	HIS	-	expression tag	UNP P0AG01
H	-6	MET	-	initiating methionine	UNP P0AG01
H	-5	GLY	-	expression tag	UNP P0AG01
H	-4	SER	-	expression tag	UNP P0AG01
H	-3	HIS	-	expression tag	UNP P0AG01
H	-2	HIS	-	expression tag	UNP P0AG01
H	-1	HIS	-	expression tag	UNP P0AG01
H	0	HIS	-	expression tag	UNP P0AG01
H	1	HIS	-	expression tag	UNP P0AG01
H	2	HIS	-	expression tag	UNP P0AG01
I	-6	MET	-	initiating methionine	UNP P0AG01
I	-5	GLY	-	expression tag	UNP P0AG01
I	-4	SER	-	expression tag	UNP P0AG01
I	-3	HIS	-	expression tag	UNP P0AG01
I	-2	HIS	-	expression tag	UNP P0AG01
I	-1	HIS	-	expression tag	UNP P0AG01
I	0	HIS	-	expression tag	UNP P0AG01
I	1	HIS	-	expression tag	UNP P0AG01
I	2	HIS	-	expression tag	UNP P0AG01
J	-6	MET	-	initiating methionine	UNP P0AG01
J	-5	GLY	-	expression tag	UNP P0AG01
J	-4	SER	-	expression tag	UNP P0AG01
J	-3	HIS	-	expression tag	UNP P0AG01
J	-2	HIS	-	expression tag	UNP P0AG01
J	-1	HIS	-	expression tag	UNP P0AG01
J	0	HIS	-	expression tag	UNP P0AG01
J	1	HIS	-	expression tag	UNP P0AG01
J	2	HIS	-	expression tag	UNP P0AG01
K	-6	MET	-	initiating methionine	UNP P0AG01

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Chain	Residue	Modelled	Actual	Comment	Reference
K	-5	GLY	-	expression tag	UNP P0AG01
K	-4	SER	-	expression tag	UNP P0AG01
K	-3	HIS	-	expression tag	UNP P0AG01
K	-2	HIS	-	expression tag	UNP P0AG01
K	-1	HIS	-	expression tag	UNP P0AG01
K	0	HIS	-	expression tag	UNP P0AG01
K	1	HIS	-	expression tag	UNP P0AG01
K	2	HIS	-	expression tag	UNP P0AG01
L	-6	MET	-	initiating methionine	UNP P0AG01
L	-5	GLY	-	expression tag	UNP P0AG01
L	-4	SER	-	expression tag	UNP P0AG01
L	-3	HIS	-	expression tag	UNP P0AG01
L	-2	HIS	-	expression tag	UNP P0AG01
L	-1	HIS	-	expression tag	UNP P0AG01
L	0	HIS	-	expression tag	UNP P0AG01
L	1	HIS	-	expression tag	UNP P0AG01
L	2	HIS	-	expression tag	UNP P0AG01
M	-6	MET	-	initiating methionine	UNP P0AG01
M	-5	GLY	-	expression tag	UNP P0AG01
M	-4	SER	-	expression tag	UNP P0AG01
M	-3	HIS	-	expression tag	UNP P0AG01
M	-2	HIS	-	expression tag	UNP P0AG01
M	-1	HIS	-	expression tag	UNP P0AG01
M	0	HIS	-	expression tag	UNP P0AG01
M	1	HIS	-	expression tag	UNP P0AG01
M	2	HIS	-	expression tag	UNP P0AG01
N	-6	MET	-	initiating methionine	UNP P0AG01
N	-5	GLY	-	expression tag	UNP P0AG01
N	-4	SER	-	expression tag	UNP P0AG01
N	-3	HIS	-	expression tag	UNP P0AG01
N	-2	HIS	-	expression tag	UNP P0AG01
N	-1	HIS	-	expression tag	UNP P0AG01
N	0	HIS	-	expression tag	UNP P0AG01
N	1	HIS	-	expression tag	UNP P0AG01
N	2	HIS	-	expression tag	UNP P0AG01
O	-6	MET	-	initiating methionine	UNP P0AG01
O	-5	GLY	-	expression tag	UNP P0AG01
O	-4	SER	-	expression tag	UNP P0AG01
O	-3	HIS	-	expression tag	UNP P0AG01
O	-2	HIS	-	expression tag	UNP P0AG01
O	-1	HIS	-	expression tag	UNP P0AG01
O	0	HIS	-	expression tag	UNP P0AG01

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Chain	Residue	Modelled	Actual	Comment	Reference
O	1	HIS	-	expression tag	UNP P0AG01
O	2	HIS	-	expression tag	UNP P0AG01
P	-6	MET	-	initiating methionine	UNP P0AG01
P	-5	GLY	-	expression tag	UNP P0AG01
P	-4	SER	-	expression tag	UNP P0AG01
P	-3	HIS	-	expression tag	UNP P0AG01
P	-2	HIS	-	expression tag	UNP P0AG01
P	-1	HIS	-	expression tag	UNP P0AG01
P	0	HIS	-	expression tag	UNP P0AG01
P	1	HIS	-	expression tag	UNP P0AG01
P	2	HIS	-	expression tag	UNP P0AG01
Q	-6	MET	-	initiating methionine	UNP P0AG01
Q	-5	GLY	-	expression tag	UNP P0AG01
Q	-4	SER	-	expression tag	UNP P0AG01
Q	-3	HIS	-	expression tag	UNP P0AG01
Q	-2	HIS	-	expression tag	UNP P0AG01
Q	-1	HIS	-	expression tag	UNP P0AG01
Q	0	HIS	-	expression tag	UNP P0AG01
Q	1	HIS	-	expression tag	UNP P0AG01
Q	2	HIS	-	expression tag	UNP P0AG01
R	-6	MET	-	initiating methionine	UNP P0AG01
R	-5	GLY	-	expression tag	UNP P0AG01
R	-4	SER	-	expression tag	UNP P0AG01
R	-3	HIS	-	expression tag	UNP P0AG01
R	-2	HIS	-	expression tag	UNP P0AG01
R	-1	HIS	-	expression tag	UNP P0AG01
R	0	HIS	-	expression tag	UNP P0AG01
R	1	HIS	-	expression tag	UNP P0AG01
R	2	HIS	-	expression tag	UNP P0AG01
S	-6	MET	-	initiating methionine	UNP P0AG01
S	-5	GLY	-	expression tag	UNP P0AG01
S	-4	SER	-	expression tag	UNP P0AG01
S	-3	HIS	-	expression tag	UNP P0AG01
S	-2	HIS	-	expression tag	UNP P0AG01
S	-1	HIS	-	expression tag	UNP P0AG01
S	0	HIS	-	expression tag	UNP P0AG01
S	1	HIS	-	expression tag	UNP P0AG01
S	2	HIS	-	expression tag	UNP P0AG01
T	-6	MET	-	initiating methionine	UNP P0AG01
T	-5	GLY	-	expression tag	UNP P0AG01
T	-4	SER	-	expression tag	UNP P0AG01
T	-3	HIS	-	expression tag	UNP P0AG01

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Chain	Residue	Modelled	Actual	Comment	Reference
T	-2	HIS	-	expression tag	UNP P0AG01
T	-1	HIS	-	expression tag	UNP P0AG01
T	0	HIS	-	expression tag	UNP P0AG01
T	1	HIS	-	expression tag	UNP P0AG01
T	2	HIS	-	expression tag	UNP P0AG01
U	-6	MET	-	initiating methionine	UNP P0AG01
U	-5	GLY	-	expression tag	UNP P0AG01
U	-4	SER	-	expression tag	UNP P0AG01
U	-3	HIS	-	expression tag	UNP P0AG01
U	-2	HIS	-	expression tag	UNP P0AG01
U	-1	HIS	-	expression tag	UNP P0AG01
U	0	HIS	-	expression tag	UNP P0AG01
U	1	HIS	-	expression tag	UNP P0AG01
U	2	HIS	-	expression tag	UNP P0AG01
V	-6	MET	-	initiating methionine	UNP P0AG01
V	-5	GLY	-	expression tag	UNP P0AG01
V	-4	SER	-	expression tag	UNP P0AG01
V	-3	HIS	-	expression tag	UNP P0AG01
V	-2	HIS	-	expression tag	UNP P0AG01
V	-1	HIS	-	expression tag	UNP P0AG01
V	0	HIS	-	expression tag	UNP P0AG01
V	1	HIS	-	expression tag	UNP P0AG01
V	2	HIS	-	expression tag	UNP P0AG01
W	-6	MET	-	initiating methionine	UNP P0AG01
W	-5	GLY	-	expression tag	UNP P0AG01
W	-4	SER	-	expression tag	UNP P0AG01
W	-3	HIS	-	expression tag	UNP P0AG01
W	-2	HIS	-	expression tag	UNP P0AG01
W	-1	HIS	-	expression tag	UNP P0AG01
W	0	HIS	-	expression tag	UNP P0AG01
W	1	HIS	-	expression tag	UNP P0AG01
W	2	HIS	-	expression tag	UNP P0AG01
X	-6	MET	-	initiating methionine	UNP P0AG01
X	-5	GLY	-	expression tag	UNP P0AG01
X	-4	SER	-	expression tag	UNP P0AG01
X	-3	HIS	-	expression tag	UNP P0AG01
X	-2	HIS	-	expression tag	UNP P0AG01
X	-1	HIS	-	expression tag	UNP P0AG01
X	0	HIS	-	expression tag	UNP P0AG01
X	1	HIS	-	expression tag	UNP P0AG01
X	2	HIS	-	expression tag	UNP P0AG01
Y	-6	MET	-	initiating methionine	UNP P0AG01

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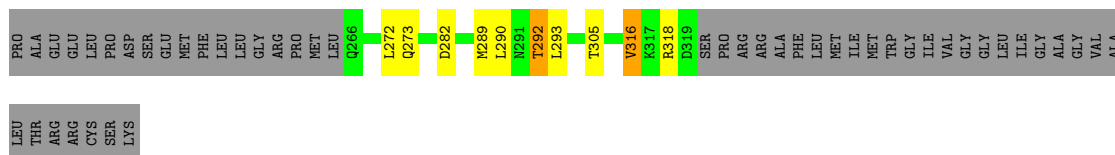
Chain	Residue	Modelled	Actual	Comment	Reference
Y	-5	GLY	-	expression tag	UNP P0AG01
Y	-4	SER	-	expression tag	UNP P0AG01
Y	-3	HIS	-	expression tag	UNP P0AG01
Y	-2	HIS	-	expression tag	UNP P0AG01
Y	-1	HIS	-	expression tag	UNP P0AG01
Y	0	HIS	-	expression tag	UNP P0AG01
Y	1	HIS	-	expression tag	UNP P0AG01
Y	2	HIS	-	expression tag	UNP P0AG01
Z	-6	MET	-	initiating methionine	UNP P0AG01
Z	-5	GLY	-	expression tag	UNP P0AG01
Z	-4	SER	-	expression tag	UNP P0AG01
Z	-3	HIS	-	expression tag	UNP P0AG01
Z	-2	HIS	-	expression tag	UNP P0AG01
Z	-1	HIS	-	expression tag	UNP P0AG01
Z	0	HIS	-	expression tag	UNP P0AG01
Z	1	HIS	-	expression tag	UNP P0AG01
Z	2	HIS	-	expression tag	UNP P0AG01
a	-6	MET	-	initiating methionine	UNP P0AG01
a	-5	GLY	-	expression tag	UNP P0AG01
a	-4	SER	-	expression tag	UNP P0AG01
a	-3	HIS	-	expression tag	UNP P0AG01
a	-2	HIS	-	expression tag	UNP P0AG01
a	-1	HIS	-	expression tag	UNP P0AG01
a	0	HIS	-	expression tag	UNP P0AG01
a	1	HIS	-	expression tag	UNP P0AG01
a	2	HIS	-	expression tag	UNP P0AG01
b	-6	MET	-	initiating methionine	UNP P0AG01
b	-5	GLY	-	expression tag	UNP P0AG01
b	-4	SER	-	expression tag	UNP P0AG01
b	-3	HIS	-	expression tag	UNP P0AG01
b	-2	HIS	-	expression tag	UNP P0AG01
b	-1	HIS	-	expression tag	UNP P0AG01
b	0	HIS	-	expression tag	UNP P0AG01
b	1	HIS	-	expression tag	UNP P0AG01
b	2	HIS	-	expression tag	UNP P0AG01
c	-6	MET	-	initiating methionine	UNP P0AG01
c	-5	GLY	-	expression tag	UNP P0AG01
c	-4	SER	-	expression tag	UNP P0AG01
c	-3	HIS	-	expression tag	UNP P0AG01
c	-2	HIS	-	expression tag	UNP P0AG01
c	-1	HIS	-	expression tag	UNP P0AG01
c	0	HIS	-	expression tag	UNP P0AG01

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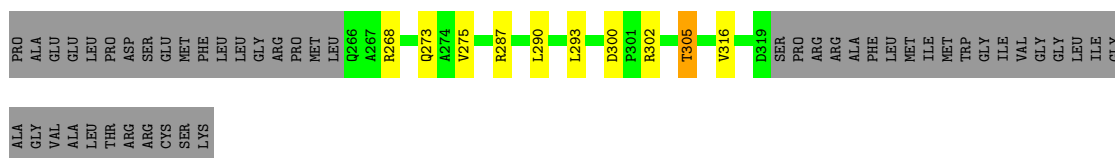
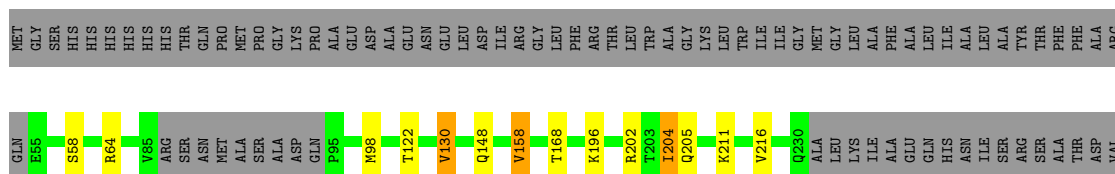
Chain	Residue	Modelled	Actual	Comment	Reference
c	1	HIS	-	expression tag	UNP P0AG01
c	2	HIS	-	expression tag	UNP P0AG01
d	-6	MET	-	initiating methionine	UNP P0AG01
d	-5	GLY	-	expression tag	UNP P0AG01
d	-4	SER	-	expression tag	UNP P0AG01
d	-3	HIS	-	expression tag	UNP P0AG01
d	-2	HIS	-	expression tag	UNP P0AG01
d	-1	HIS	-	expression tag	UNP P0AG01
d	0	HIS	-	expression tag	UNP P0AG01
d	1	HIS	-	expression tag	UNP P0AG01
d	2	HIS	-	expression tag	UNP P0AG01
e	-6	MET	-	initiating methionine	UNP P0AG01
e	-5	GLY	-	expression tag	UNP P0AG01
e	-4	SER	-	expression tag	UNP P0AG01
e	-3	HIS	-	expression tag	UNP P0AG01
e	-2	HIS	-	expression tag	UNP P0AG01
e	-1	HIS	-	expression tag	UNP P0AG01
e	0	HIS	-	expression tag	UNP P0AG01
e	1	HIS	-	expression tag	UNP P0AG01
e	2	HIS	-	expression tag	UNP P0AG01
f	-6	MET	-	initiating methionine	UNP P0AG01
f	-5	GLY	-	expression tag	UNP P0AG01
f	-4	SER	-	expression tag	UNP P0AG01
f	-3	HIS	-	expression tag	UNP P0AG01
f	-2	HIS	-	expression tag	UNP P0AG01
f	-1	HIS	-	expression tag	UNP P0AG01
f	0	HIS	-	expression tag	UNP P0AG01
f	1	HIS	-	expression tag	UNP P0AG01
f	2	HIS	-	expression tag	UNP P0AG01





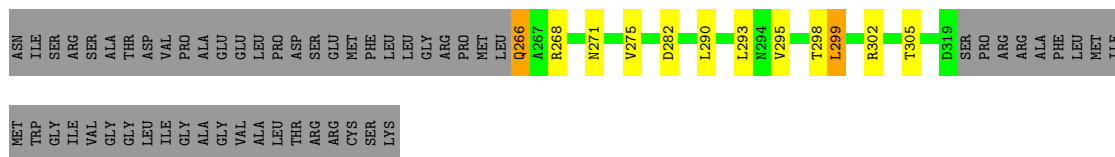
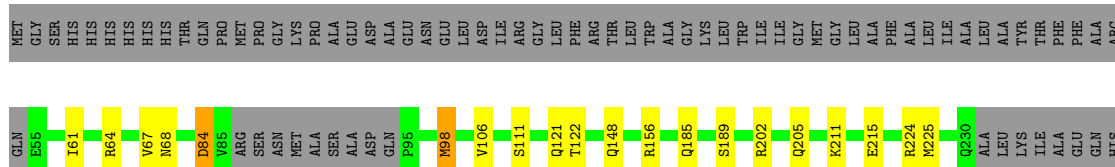
- Molecule 1: Lipopolysaccharide biosynthesis protein WzzE

Chain D: 55% 6% 38%



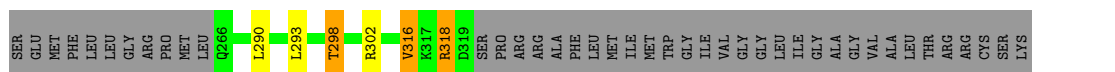
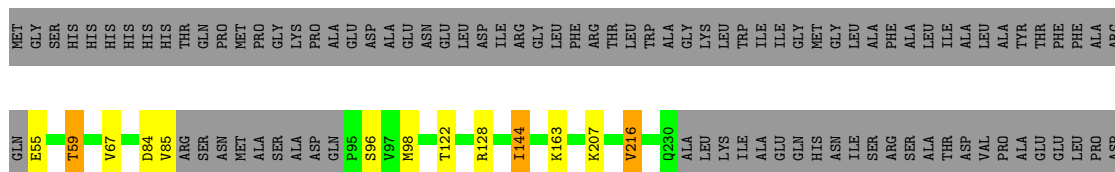
- Molecule 1: Lipopolysaccharide biosynthesis protein WzzE

Chain E: 53% 8% 38%



- Molecule 1: Lipopolysaccharide biosynthesis protein WzzE

Chain F: 57% 0% 38%



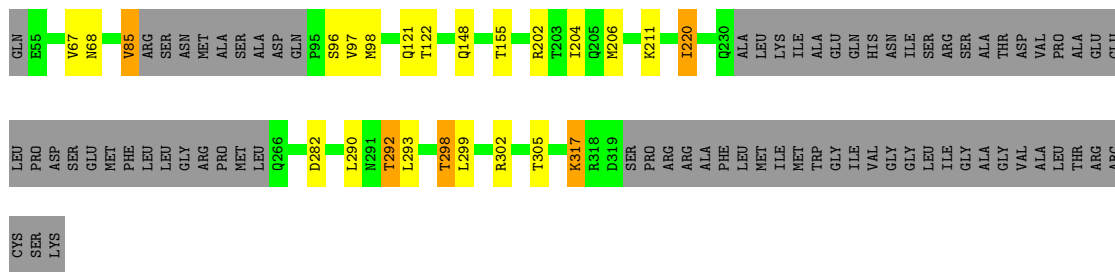
- Molecule 1: Lipopolysaccharide biosynthesis protein WzzE



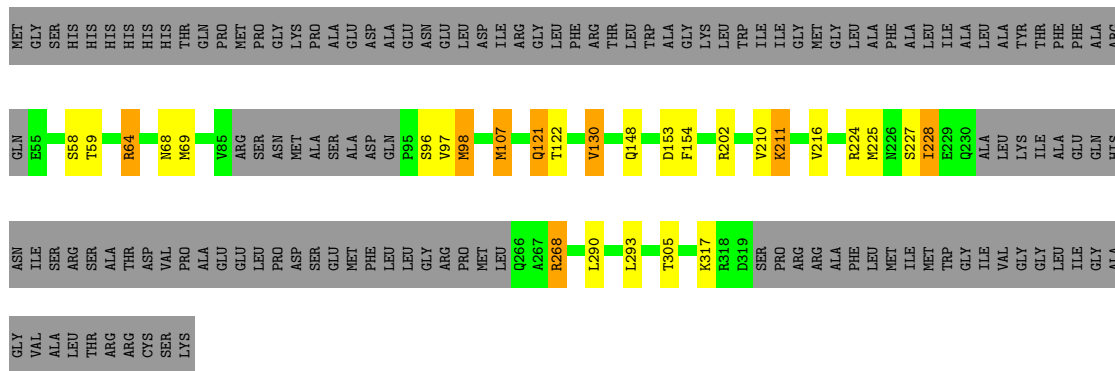




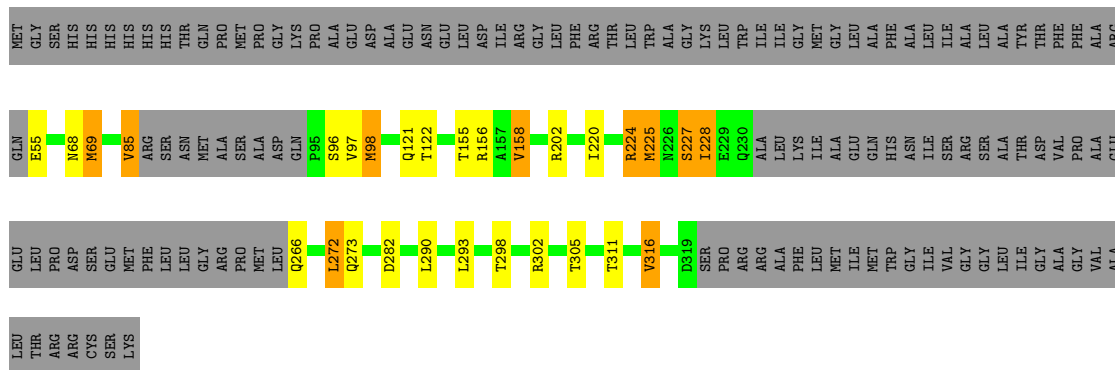




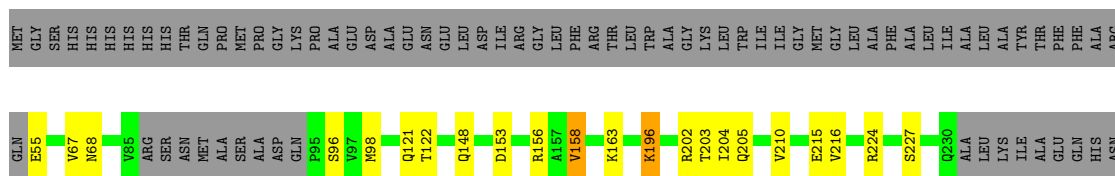
• Molecule 1: Lipopolysaccharide biosynthesis protein WzzE



• Molecule 1: Lipopolysaccharide biosynthesis protein WzzE

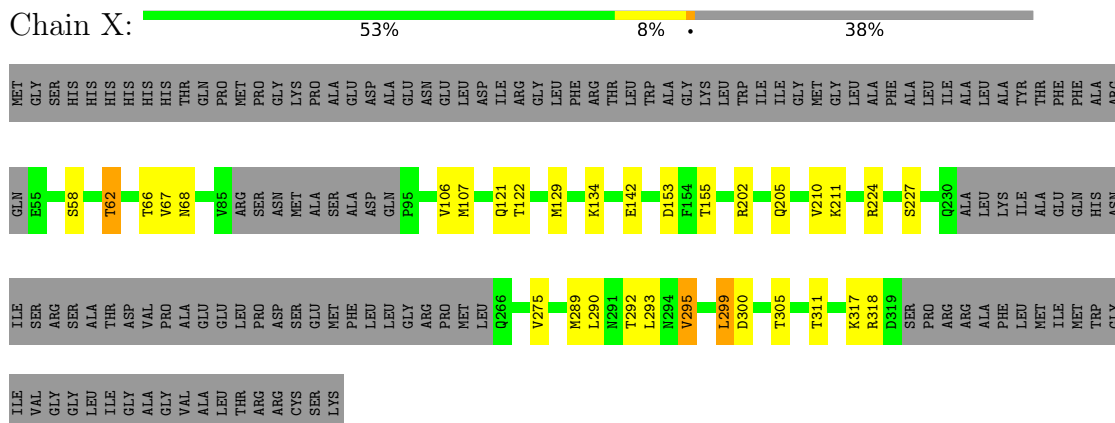


• Molecule 1: Lipopolysaccharide biosynthesis protein WzzE

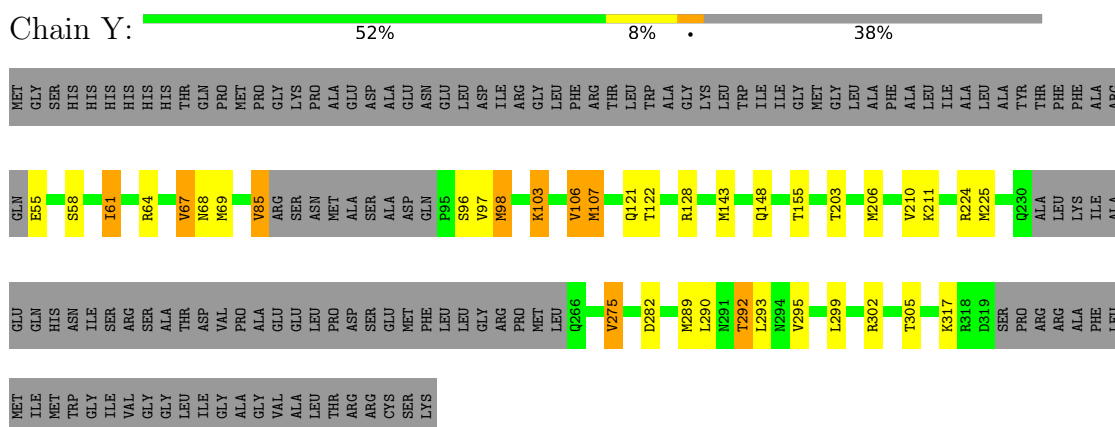




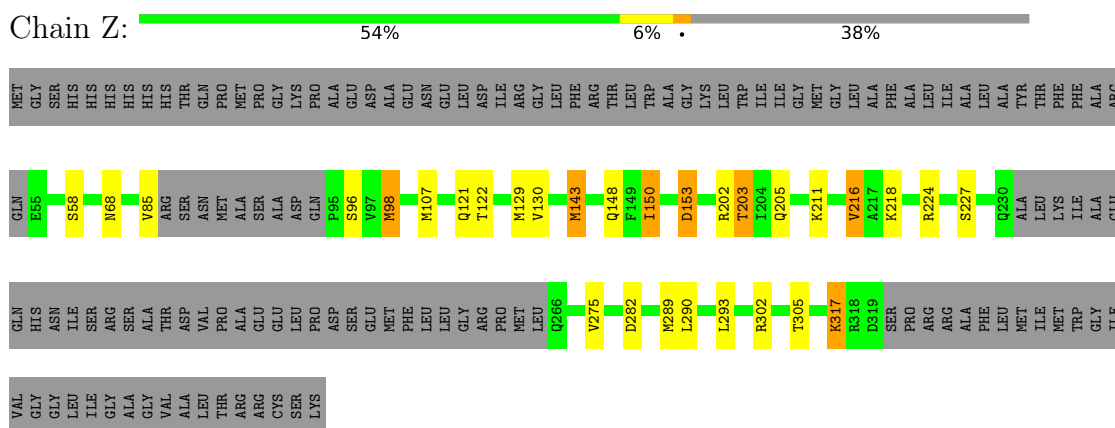
- Molecule 1: Lipopolysaccharide biosynthesis protein WzzE



- Molecule 1: Lipopolysaccharide biosynthesis protein WzzE



- Molecule 1: Lipopolysaccharide biosynthesis protein WzzE



- Molecule 1: Lipopolysaccharide biosynthesis protein WzzE







## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	276.85Å 246.31Å 133.20Å 90.00° 89.99° 90.00°	Depositor
Resolution (Å)	47.81 – 5.99 47.81 – 5.99	Depositor EDS
% Data completeness (in resolution range)	96.4 (47.81-5.99) 96.3 (47.81-5.99)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.85 (at 6.15Å)	Xtrriage
Refinement program	PHENIX (phenix.refine: 1.9_1692)	Depositor
R, $R_{free}$	0.234 , 0.245 0.306 , 0.316	Depositor DCC
$R_{free}$ test set	2170 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	234.9	Xtrriage
Anisotropy	0.147	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.25 , 97.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.38$ , $\langle L^2 \rangle = 0.21$	Xtrriage
Estimated twinning fraction	0.340 for -h,-k,l	Xtrriage
$F_o, F_c$ correlation	0.87	EDS
Total number of atoms	57504	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	300.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.94% of the height of the origin peak. No significant pseudotranslation is detected.*

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

<sup>2</sup>Theoretical 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

### 5.1 Standard geometry

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	0.52	1/1830 (0.1%)	1.17	9/2475 (0.4%)
1	B	0.56	0/1830	1.05	14/2475 (0.6%)
1	C	0.51	1/1830 (0.1%)	0.98	8/2475 (0.3%)
1	D	0.53	0/1830	1.01	10/2475 (0.4%)
1	E	0.57	0/1830	1.04	15/2475 (0.6%)
1	F	0.52	0/1830	1.01	11/2475 (0.4%)
1	G	0.46	0/1830	1.05	13/2475 (0.5%)
1	H	0.46	0/1830	0.93	8/2475 (0.3%)
1	I	0.48	0/1830	1.01	21/2475 (0.8%)
1	J	0.51	0/1830	1.10	16/2475 (0.6%)
1	K	0.51	1/1830 (0.1%)	1.02	13/2475 (0.5%)
1	L	0.53	0/1830	1.10	18/2475 (0.7%)
1	M	0.55	0/1830	1.14	20/2475 (0.8%)
1	N	0.57	0/1830	1.30	17/2475 (0.7%)
1	O	0.55	0/1830	1.02	12/2475 (0.5%)
1	P	0.59	1/1830 (0.1%)	1.21	20/2475 (0.8%)
1	Q	0.50	0/1830	1.02	13/2475 (0.5%)
1	R	0.60	1/1830 (0.1%)	1.22	23/2475 (0.9%)
1	S	0.54	1/1830 (0.1%)	1.12	21/2475 (0.8%)
1	T	0.61	2/1830 (0.1%)	1.21	19/2475 (0.8%)
1	U	0.57	1/1830 (0.1%)	1.16	12/2475 (0.5%)
1	V	0.52	0/1830	1.10	13/2475 (0.5%)
1	W	0.56	1/1830 (0.1%)	1.19	19/2475 (0.8%)
1	X	0.59	1/1830 (0.1%)	1.13	15/2475 (0.6%)
1	Y	0.61	1/1830 (0.1%)	1.33	22/2475 (0.9%)
1	Z	0.53	0/1830	1.10	21/2475 (0.8%)
1	a	0.59	1/1830 (0.1%)	1.18	19/2475 (0.8%)
1	b	0.61	1/1830 (0.1%)	1.19	22/2475 (0.9%)
1	c	0.51	0/1830	1.11	21/2475 (0.8%)
1	d	0.52	1/1830 (0.1%)	1.18	22/2475 (0.9%)
1	e	0.54	0/1830	1.19	26/2475 (1.1%)
1	f	0.57	0/1830	1.19	26/2475 (1.1%)
All	All	0.55	15/58560 (0.0%)	1.12	539/79200 (0.7%)



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	3	1
1	B	1	1
1	F	2	0
1	I	1	1
1	J	1	1
1	L	1	0
1	M	3	1
1	N	1	0
1	O	1	0
1	P	1	0
1	Q	3	0
1	R	2	0
1	S	0	1
1	T	0	1
1	U	1	0
1	V	0	1
1	W	1	1
1	X	1	1
1	Y	1	0
1	a	2	2
1	b	1	0
1	c	1	0
1	d	2	0
1	e	3	1
All	All	33	13

The worst 5 of 15 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	T	163	LYS	CD-CE	8.53	1.72	1.51
1	X	66	THR	CB-CG2	-7.76	1.26	1.52
1	b	59	THR	CB-CG2	-7.76	1.26	1.52
1	R	59	THR	CB-CG2	-6.83	1.29	1.52
1	d	305	THR	CB-CG2	-6.58	1.30	1.52

The worst 5 of 539 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	d	61	ILE	CG1-CB-CG2	-22.93	60.96	111.40
1	A	67	VAL	CG1-CB-CG2	-22.35	75.14	110.90
1	N	67	VAL	CG1-CB-CG2	-21.79	76.04	110.90
1	U	275	VAL	CG1-CB-CG2	-20.75	77.69	110.90
1	Y	128	ARG	NE-CZ-NH1	-20.73	109.94	120.30

5 of 33 chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	A	59	THR	CB
1	A	168	THR	CB
1	A	305	THR	CB
1	B	62	THR	CB
1	F	59	THR	CB

5 of 13 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	215	GLU	Sidechain
1	B	279	PHE	Sidechain
1	I	148	GLN	Sidechain
1	J	300	ASP	Sidechain
1	M	148	GLN	Sidechain

## 5.2 Too-close contacts [i](#)

Due to software issues we are unable to calculate clashes - this section is therefore empty.

## 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	215/356 (60%)	209 (97%)	6 (3%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	215/356 (60%)	212 (99%)	3 (1%)	0	100	100
1	C	215/356 (60%)	213 (99%)	2 (1%)	0	100	100
1	D	215/356 (60%)	211 (98%)	4 (2%)	0	100	100
1	E	215/356 (60%)	212 (99%)	2 (1%)	1 (0%)	29	69
1	F	215/356 (60%)	210 (98%)	4 (2%)	1 (0%)	29	69
1	G	215/356 (60%)	211 (98%)	3 (1%)	1 (0%)	29	69
1	H	215/356 (60%)	211 (98%)	3 (1%)	1 (0%)	29	69
1	I	215/356 (60%)	209 (97%)	6 (3%)	0	100	100
1	J	215/356 (60%)	210 (98%)	5 (2%)	0	100	100
1	K	215/356 (60%)	209 (97%)	6 (3%)	0	100	100
1	L	215/356 (60%)	210 (98%)	5 (2%)	0	100	100
1	M	215/356 (60%)	207 (96%)	8 (4%)	0	100	100
1	N	215/356 (60%)	208 (97%)	7 (3%)	0	100	100
1	O	215/356 (60%)	210 (98%)	5 (2%)	0	100	100
1	P	215/356 (60%)	209 (97%)	6 (3%)	0	100	100
1	Q	215/356 (60%)	210 (98%)	5 (2%)	0	100	100
1	R	215/356 (60%)	211 (98%)	4 (2%)	0	100	100
1	S	215/356 (60%)	209 (97%)	6 (3%)	0	100	100
1	T	215/356 (60%)	210 (98%)	5 (2%)	0	100	100
1	U	215/356 (60%)	209 (97%)	6 (3%)	0	100	100
1	V	215/356 (60%)	210 (98%)	5 (2%)	0	100	100
1	W	215/356 (60%)	209 (97%)	6 (3%)	0	100	100
1	X	215/356 (60%)	209 (97%)	6 (3%)	0	100	100
1	Y	215/356 (60%)	210 (98%)	5 (2%)	0	100	100
1	Z	215/356 (60%)	211 (98%)	4 (2%)	0	100	100
1	a	215/356 (60%)	208 (97%)	7 (3%)	0	100	100
1	b	215/356 (60%)	211 (98%)	4 (2%)	0	100	100
1	c	215/356 (60%)	209 (97%)	6 (3%)	0	100	100
1	d	215/356 (60%)	210 (98%)	5 (2%)	0	100	100
1	e	215/356 (60%)	209 (97%)	6 (3%)	0	100	100
1	f	215/356 (60%)	209 (97%)	6 (3%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	6880/11392 (60%)	6715 (98%)	161 (2%)	4 (0%)	51 85

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	E	275	VAL
1	H	303	PHE
1	F	318	ARG
1	G	269	LEU

### 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	190/296 (64%)	165 (87%)	25 (13%)	4 18
1	B	190/296 (64%)	174 (92%)	16 (8%)	11 34
1	C	190/296 (64%)	169 (89%)	21 (11%)	6 22
1	D	190/296 (64%)	173 (91%)	17 (9%)	9 31
1	E	190/296 (64%)	166 (87%)	24 (13%)	4 19
1	F	190/296 (64%)	175 (92%)	15 (8%)	12 36
1	G	190/296 (64%)	175 (92%)	15 (8%)	12 36
1	H	190/296 (64%)	167 (88%)	23 (12%)	5 20
1	I	190/296 (64%)	165 (87%)	25 (13%)	4 18
1	J	190/296 (64%)	169 (89%)	21 (11%)	6 22
1	K	190/296 (64%)	167 (88%)	23 (12%)	5 20
1	L	190/296 (64%)	164 (86%)	26 (14%)	3 17
1	M	190/296 (64%)	162 (85%)	28 (15%)	3 15
1	N	190/296 (64%)	174 (92%)	16 (8%)	11 34
1	O	190/296 (64%)	172 (90%)	18 (10%)	8 28
1	P	190/296 (64%)	166 (87%)	24 (13%)	4 19

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	Q	190/296 (64%)	172 (90%)	18 (10%)	8	28
1	R	190/296 (64%)	170 (90%)	20 (10%)	7	24
1	S	190/296 (64%)	167 (88%)	23 (12%)	5	20
1	T	190/296 (64%)	171 (90%)	19 (10%)	7	26
1	U	190/296 (64%)	165 (87%)	25 (13%)	4	18
1	V	190/296 (64%)	172 (90%)	18 (10%)	8	28
1	W	190/296 (64%)	173 (91%)	17 (9%)	9	31
1	X	190/296 (64%)	171 (90%)	19 (10%)	7	26
1	Y	190/296 (64%)	161 (85%)	29 (15%)	2	14
1	Z	190/296 (64%)	166 (87%)	24 (13%)	4	19
1	a	190/296 (64%)	168 (88%)	22 (12%)	5	21
1	b	190/296 (64%)	167 (88%)	23 (12%)	5	20
1	c	190/296 (64%)	169 (89%)	21 (11%)	6	22
1	d	190/296 (64%)	171 (90%)	19 (10%)	7	26
1	e	190/296 (64%)	168 (88%)	22 (12%)	5	21
1	f	190/296 (64%)	169 (89%)	21 (11%)	6	22
All	All	6080/9472 (64%)	5403 (89%)	677 (11%)	6	22

5 of 677 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	W	98	MET
1	b	69	MET
1	W	318	ARG
1	W	85	VAL
1	Y	293	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 312 such sidechains are listed below:

Mol	Chain	Res	Type
1	X	145	ASN
1	d	145	ASN
1	X	273	GLN
1	a	145	ASN
1	f	82	ASN

### 5.3.3 RNA [i](#)

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 monosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

There are no ligands in this entry.

### 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

Unable to reproduce the depositors R factor - this section is therefore empty.

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

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.3 Carbohydrates

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.4 Ligands

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.5 Other polymers

Unable to reproduce the depositors R factor - this section is therefore empty.