wwPDB X-ray Structure Validation Summary Report (i)

Feb 5, 2024 – 12:21 PM JST

PDB ID	:	8WY1
Title	:	The structure of cyclization domain in cyclic beta-1,2-glucan synthase from Thermoanaerobacter italicus
Authors	:	Tanaka, N.; Saito, R.; Kobayashi, K.; Nakai, H.; Kamo, S.; Kuramochi, K.; Taguchi, H.; Nakajima, M.; Masaike, T.
Deposited on	:	2023-10-30
Resolution	:	3.90 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 (1)) were used in the production of this report:

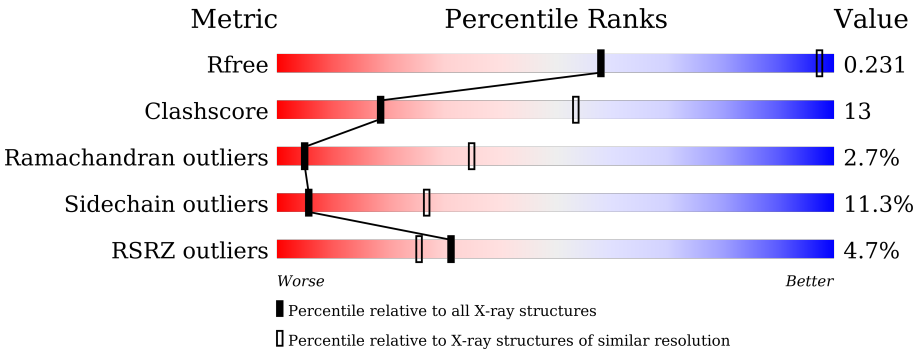
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.36
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

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 3.90 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	1002 (4.14-3.66)
Clashscore	141614	1004 (4.12-3.68)
Ramachandran outliers	138981	1021 (4.14-3.66)
Sidechain outliers	138945	1014 (4.14-3.66)
RSRZ outliers	127900	1275 (4.20-3.60)

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	596	% 62% 32%
1	B	596	3% 60% 32%
1	C	596	5% 60% 31% 6%
1	D	596	9% 58% 33% 5%

2 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 18842 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 Glycosyltransferase 36.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	574	Total	C	N	O	S	0	0	0
			4715	3047	772	881	15			
1	B	573	Total	C	N	O	S	0	0	0
			4706	3042	771	878	15			
1	C	573	Total	C	N	O	S	0	0	0
			4706	3042	771	878	15			
1	D	574	Total	C	N	O	S	0	0	0
			4715	3047	772	881	15			

There are 36 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1004	MET	-	initiating methionine	UNP D3T4C1
A	1592	LEU	-	expression tag	UNP D3T4C1
A	1593	GLU	-	expression tag	UNP D3T4C1
A	1594	HIS	-	expression tag	UNP D3T4C1
A	1595	HIS	-	expression tag	UNP D3T4C1
A	1596	HIS	-	expression tag	UNP D3T4C1
A	1597	HIS	-	expression tag	UNP D3T4C1
A	1598	HIS	-	expression tag	UNP D3T4C1
A	1599	HIS	-	expression tag	UNP D3T4C1
B	1004	MET	-	initiating methionine	UNP D3T4C1
B	1592	LEU	-	expression tag	UNP D3T4C1
B	1593	GLU	-	expression tag	UNP D3T4C1
B	1594	HIS	-	expression tag	UNP D3T4C1
B	1595	HIS	-	expression tag	UNP D3T4C1
B	1596	HIS	-	expression tag	UNP D3T4C1
B	1597	HIS	-	expression tag	UNP D3T4C1
B	1598	HIS	-	expression tag	UNP D3T4C1
B	1599	HIS	-	expression tag	UNP D3T4C1
C	1004	MET	-	initiating methionine	UNP D3T4C1
C	1592	LEU	-	expression tag	UNP D3T4C1
C	1593	GLU	-	expression tag	UNP D3T4C1

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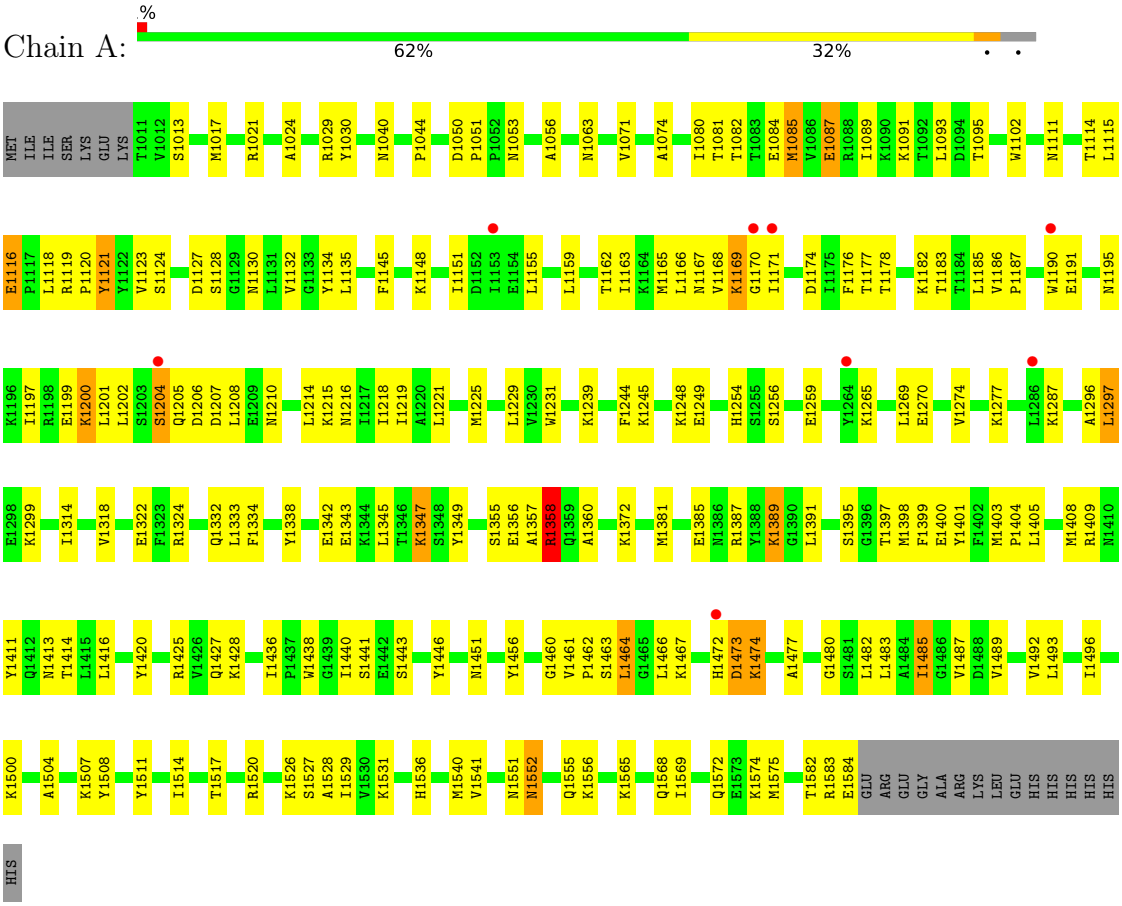
Chain	Residue	Modelled	Actual	Comment	Reference
C	1594	HIS	-	expression tag	UNP D3T4C1
C	1595	HIS	-	expression tag	UNP D3T4C1
C	1596	HIS	-	expression tag	UNP D3T4C1
C	1597	HIS	-	expression tag	UNP D3T4C1
C	1598	HIS	-	expression tag	UNP D3T4C1
C	1599	HIS	-	expression tag	UNP D3T4C1
D	1004	MET	-	initiating methionine	UNP D3T4C1
D	1592	LEU	-	expression tag	UNP D3T4C1
D	1593	GLU	-	expression tag	UNP D3T4C1
D	1594	HIS	-	expression tag	UNP D3T4C1
D	1595	HIS	-	expression tag	UNP D3T4C1
D	1596	HIS	-	expression tag	UNP D3T4C1
D	1597	HIS	-	expression tag	UNP D3T4C1
D	1598	HIS	-	expression tag	UNP D3T4C1
D	1599	HIS	-	expression tag	UNP D3T4C1

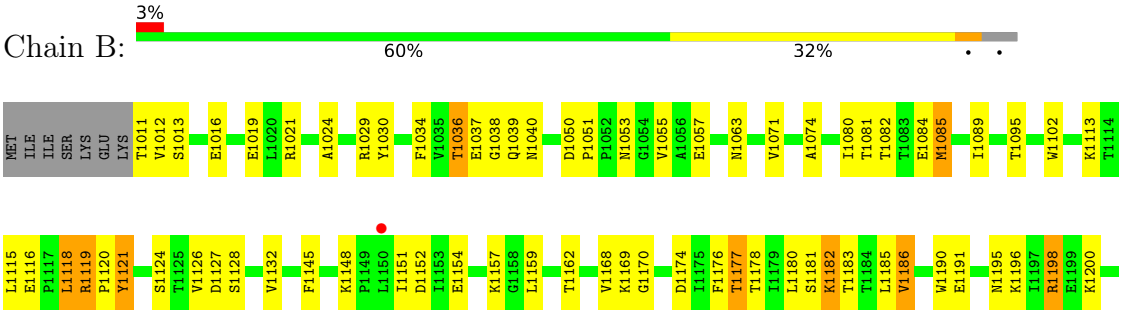
3 Residue-property plots (i)

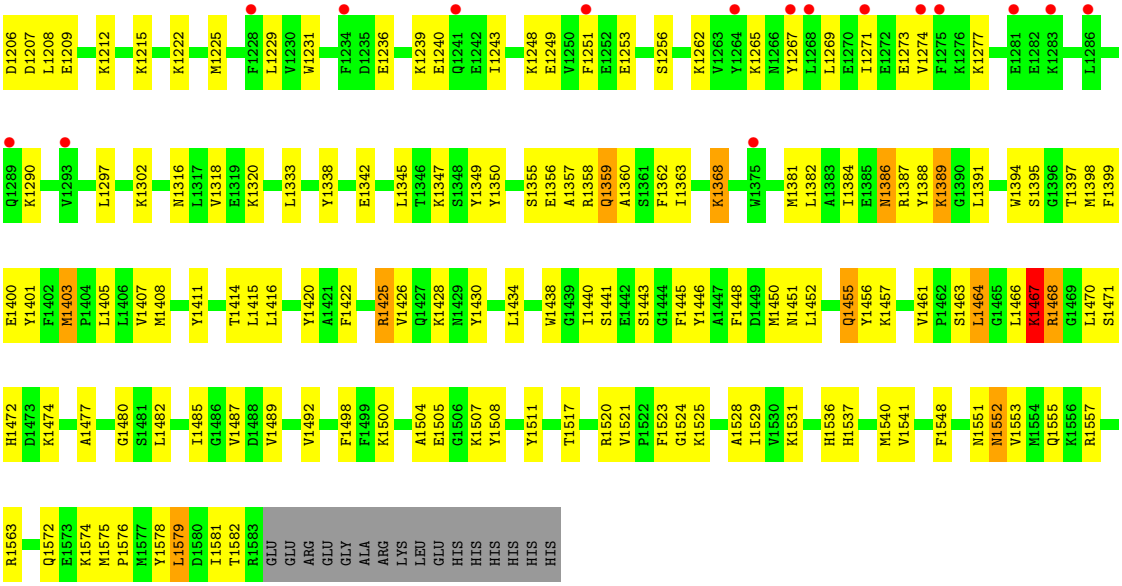
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: Glycosyltransferase 36



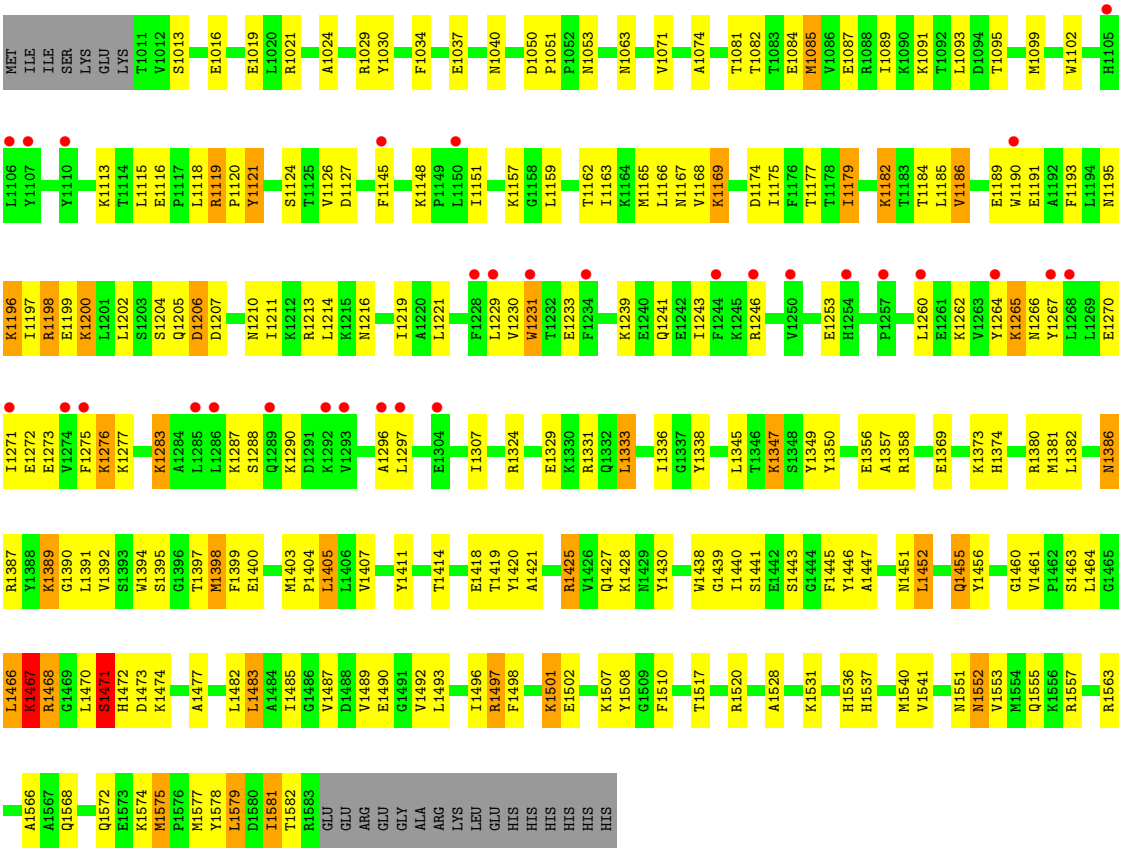
• Molecule 1: Glycosyltransferase 36





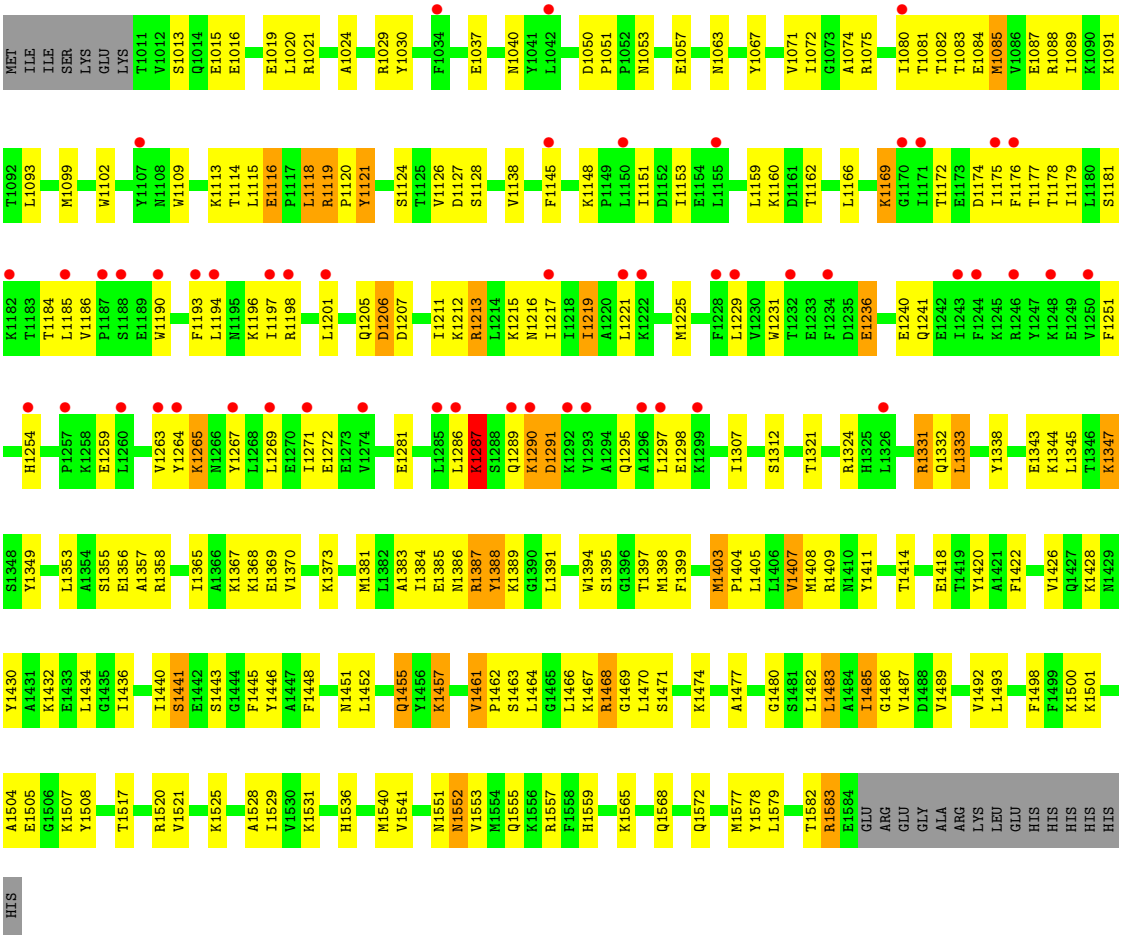
• Molecule 1: Glycosyltransferase 36

Chain C:



• Molecule 1: Glycosyltransferase 36

Chain D:


MET T1011 Y1012 S1013 Q1014 E1015 E1016 E1019 L1020 R1021 A1024 R1029 Y1030 F1034 E1037 N1040 Y1041 L1042 D1050 P1051 P1052 N1053 E1057 N1063 Y1067 V1071 I1072 G1073 A1074 R1075 I1080 T1081 T1082 T1083 E1084 M1085 V1086 E1087 R1088 I1089 K1090 K1091
T1092 L1093 M1099 W1102 Y1107 N1108 W1109 K1113 T1114 L1115 E1116 P1117 L1118 R1119 P1120 Y1121 S1124 T1125 V1126 D1127 S1128 V1138 F1145 K1148 P1149 L1150 I1151 D1152 I1153 E1154 L1155 L1159 K1160 D1161 T1162 L1166 K1169 G1170 I1171 T1172 E1173 D1174 I1175 F1176 T1177 T1178 I1179 L1180 S1181
K1182 T1183 T1184 L1185 V1186 P1187 S1188 E1189 W1190 F1193 L1194 N1195 K1196 I1197 R1198 L1201 Q1205 D1206 D1207 I1211 K1212 R1213 L1214 K1215 N1216 I1217 I1218 I1219 A1220 L1221 K1222 M1225 F1228 L1229 V1230 W1231 T1232 E1233 F1234 D1235 E1236 E1240 Q1241 E1242 T1243 F1244 K1245 R1246 Y1247 K1248 E1249 V1250 F1251
H1254 P1257 K1258 E1259 L1260 V1263 Y1264 K1265 N1266 Y1267 L1268 L1269 E1270 I1271 E1272 E1273 V1274 E1281 L1285 L1286 K1287 S1288 Q1289 K1290 D1291 K1292 V1293 A1294 Q1295 A1296 L1297 E1298 K1299 I1307 S1312 T1321 R1324 H1325 L1326 R1331 Q1332 L1333 Y1338 E1343 K1344 L1345 T1346 K1347
S1348 Y1349 L1353 A1354 S1355 E1356 A1357 R1358 I1365 A1366 K1367 K1368 E1369 V1370 K1373 M1381 L1382 A1383 I1384 E1385 N1386 R1387 Y1388 K1389 G1390 L1391 W1394 S1395 G1396 T1397 M1398 F1399 M1403 P1404 L1405 L1406 V1407 M1408 R1409 N1410 Y1411 T1414 E1418 T1419 Y1420 A1421 F1422 V1426 Q1427 K1428 N1429
Y1430 A1431 K1432 E1433 L1434 G1435 I1436 I1440 S1441 E1442 S1443 G1444 F1445 Y1446 A1447 F1448 N1451 L1452 Q1455 Y1456 K1457 V1461 P1462 S1463 L1464 G1465 L1466 K1467 R1468 G1469 L1470 S1471 K1474 A1477 G1480 S1481 L1482 L1483 A1484 I1485 G1486 V1487 D1488 V1489 V1492 L1493 F1498 F1499 K1500 K1501
A1504 E1505 G1506 K1507 Y1508 T1517 R1520 V1521 K1525 A1528 I1529 V1530 K1531 H1536 M1540 V1541 N1551 N1552 V1553 M1554 Q1555 K1556 R1557 F1588 H1559 K1565 Q1568 Q1572 M1577 Y1578 L1579 T1582 R1583 E1584 GLU ARG GLU GLY ALA ARG LYS LEU GLU HIS HIS HIS HIS
HIS

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α, β, γ	172.72Å 172.72Å 395.60Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	89.60 – 3.90 89.60 – 3.90	Depositor EDS
% Data completeness (in resolution range)	100.0 (89.60-3.90) 100.0 (89.60-3.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.32 (at 3.89Å)	Xtriage
Refinement program	REFMAC 5.8.0267	Depositor
R, R_{free}	0.198 , 0.232 0.204 , 0.231	Depositor DCC
R_{free} test set	2738 reflections (4.94%)	wwPDB-VP
Wilson B-factor (Å^2)	104.0	Xtriage
Anisotropy	0.133	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 104.1	EDS
L-test for twinning[2]	$< \|L\| > = 0.45$, $< L^2 > = 0.27$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	18842	wwPDB-VP
Average B, all atoms (Å^2)	120.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.09% of the height of the origin peak. No significant pseudotranslation is detected.*

[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

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	0.69	0/4814	0.90	1/6485 (0.0%)
1	B	0.70	0/4805	0.91	0/6473
1	C	0.70	0/4805	0.90	1/6473 (0.0%)
1	D	0.69	0/4814	0.90	0/6485
All	All	0.70	0/19238	0.90	2/25916 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	1398	MET	CA-CB-CG	-6.50	102.25	113.30
1	A	1358	ARG	NE-CZ-NH1	-6.21	117.19	120.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-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 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	4715	0	4756	104	0
1	B	4706	0	4750	143	0
1	C	4706	0	4750	153	0
1	D	4715	0	4756	119	0
All	All	18842	0	19012	499	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 13.

The worst 5 of 499 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:B:1036:THR:HG23	1:B:1039:GLN:HG2	1.40	1.00
1:C:1050:ASP:HB3	1:C:1051:PRO:HD3	1.51	0.93
1:B:1387:ARG:HB3	1:C:1387:ARG:HB3	1.52	0.89
1:A:1050:ASP:HB3	1:A:1051:PRO:HD3	1.59	0.83
1:B:1395:SER:OG	1:B:1400:GLU:OE2	1.99	0.78

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	572/596 (96%)	478 (84%)	79 (14%)	15 (3%)	5 35
1	B	571/596 (96%)	483 (85%)	74 (13%)	14 (2%)	5 36
1	C	571/596 (96%)	468 (82%)	88 (15%)	15 (3%)	5 35
1	D	572/596 (96%)	463 (81%)	91 (16%)	18 (3%)	4 32
All	All	2286/2384 (96%)	1892 (83%)	332 (14%)	62 (3%)	5 35

5 of 62 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1356	GLU
1	A	1473	ASP
1	B	1356	GLU
1	B	1471	SER
1	C	1356	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 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	512/532 (96%)	460 (90%)	52 (10%)	7 30
1	B	511/532 (96%)	460 (90%)	51 (10%)	7 30
1	C	511/532 (96%)	449 (88%)	62 (12%)	5 24
1	D	512/532 (96%)	445 (87%)	67 (13%)	4 22
All	All	2046/2128 (96%)	1814 (89%)	232 (11%)	6 27

5 of 232 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	1184	THR
1	D	1466	LEU
1	C	1405	LEU
1	D	1461	VAL
1	D	1331	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	1039	GLN
1	B	1332	GLN
1	B	1453	ASN
1	C	1552	ASN
1	D	1039	GLN

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

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	574/596 (96%)	0.42	8 (1%) 75 66	60, 104, 157, 203	0
1	B	573/596 (96%)	0.44	17 (2%) 50 38	65, 105, 187, 230	0
1	C	573/596 (96%)	0.55	31 (5%) 25 21	60, 113, 212, 269	0
1	D	574/596 (96%)	0.66	52 (9%) 9 7	68, 119, 215, 279	0
All	All	2294/2384 (96%)	0.52	108 (4%) 31 25	60, 109, 199, 279	0

The worst 5 of 108 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	1264	TYR	4.9
1	C	1286	LEU	4.8
1	B	1271	ILE	4.3
1	D	1201	LEU	4.1
1	B	1275	PHE	4.1

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

There are no monosaccharides in this entry.

6.4 Ligands

There are no ligands in this entry.

6.5 Other polymers (i)

There are no such residues in this entry.