



# wwPDB X-ray Structure Validation Summary Report ⓘ

Nov 13, 2023 – 01:12 PM JST

PDB ID : 5XA0  
Title : Crystal structure of inositol 1,4,5-trisphosphate receptor cytosolic domain  
Authors : Hamada, K.; Miyatake, H.; Terauchi, A.; Mikoshiba, K.  
Deposited on : 2017-03-10  
Resolution : 5.81 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 : 2.36  
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

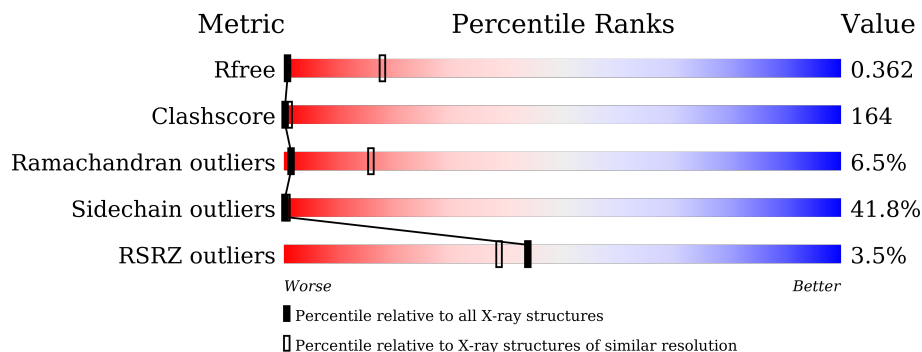
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 5.81 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	1009 (7.78-3.86)
Clashscore	141614	1035 (7.70-3.90)
Ramachandran outliers	138981	1004 (7.78-3.86)
Sidechain outliers	138945	1011 (7.82-3.82)
RSRZ outliers	127900	1009 (7.82-3.78)

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  $\leq 5\%$ . 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	1581	 2% 36% 30% 11% • 21%
1	B	1581	 3% 36% 29% 12% • 21%

## 2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 17919 atoms, of which 2970 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.

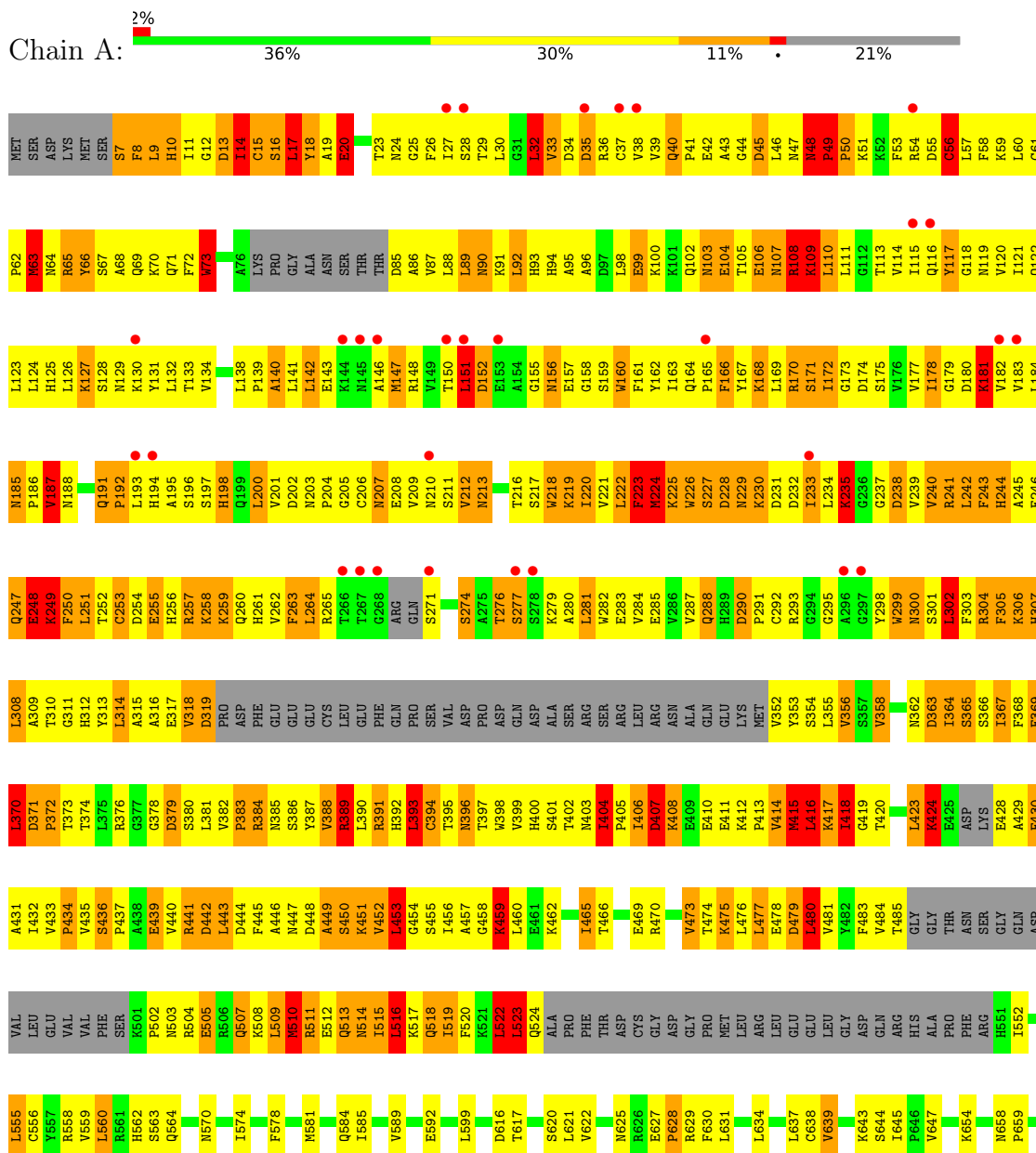
- Molecule 1 is a protein called Inositol 1,4,5-trisphosphate receptor type 1.

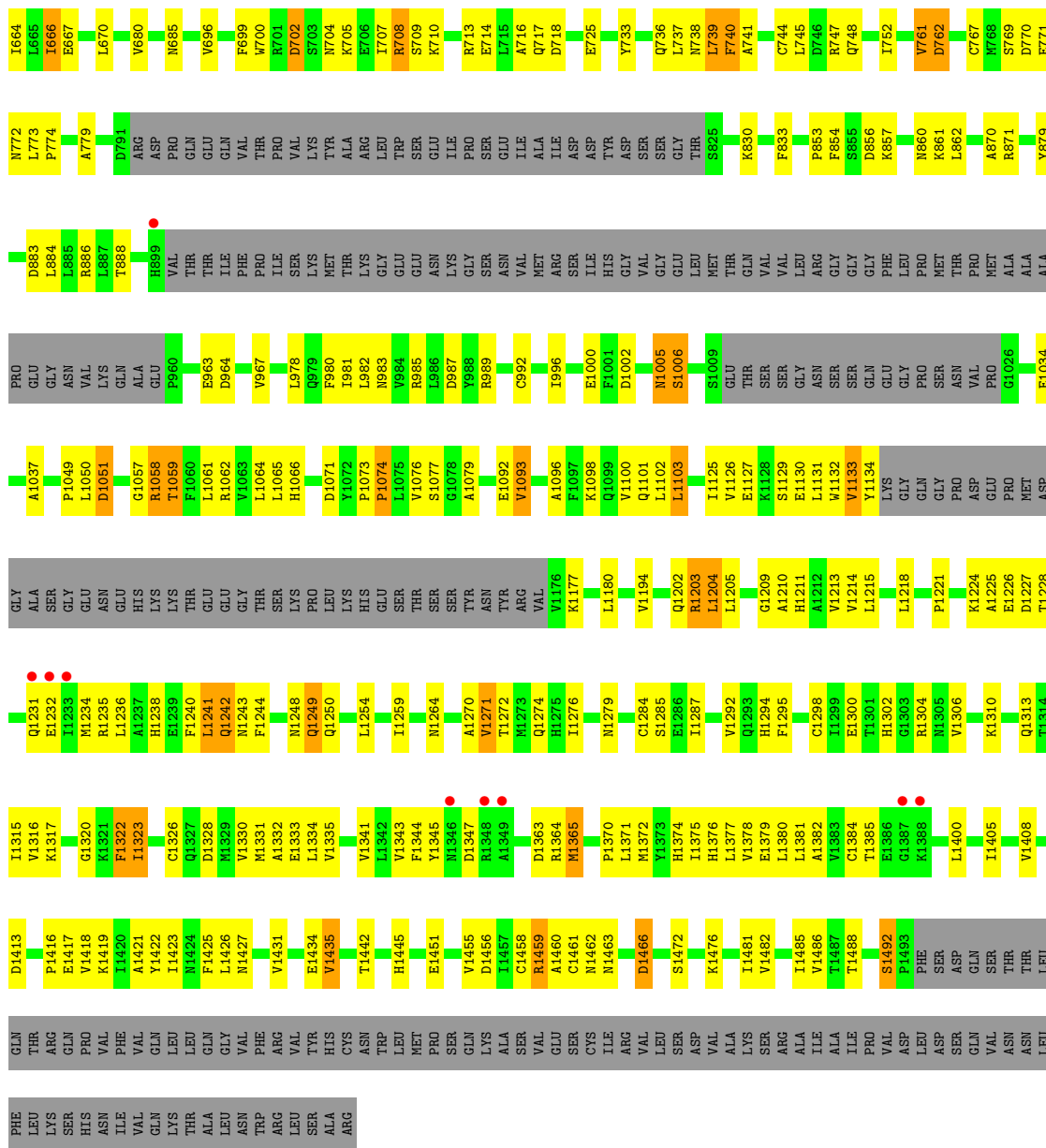
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	1252	8949	4595	1485	1410	1444	15	0	0	0
1	B	1252	8970	4610	1485	1412	1447	16	0	0	0

### 3 Residue-property plots [i](#)

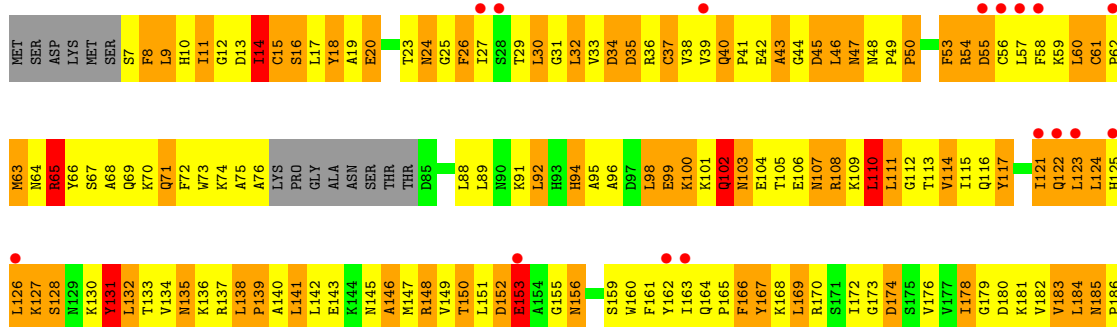
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: Inositol 1,4,5-trisphosphate receptor type 1





• Molecule 1: Inositol 1,4,5-trisphosphate receptor type 1



M1288	V1212	F1030	F876	A686	V433	T373	H312	E248	V187
M1293	V1213	E1031	Y879	L687	P434	T374	Y313	K289	M188
Q1293	V1214	H1032	A688	E688	S436	E376	L314	F250	A189
H1301	L1215	I1033	S882	A689	S435	R375	A315	L251	G190
H1302	L1216	E1034	H883	E695	A438	G377	A316	T252	Q191
I1309	L1217	E1035	L884	V696	E439	D378	D319	C253	P192
I1315	L1218	Q1036	L885	F699	R441	S380	L193	D254	L193
V1316	Q1219	M1047	T888	W700	R442	L381	H194	E255	H194
K1317	P1049	P1049	C897	W700	D442	L381	A195	E256	A195
A1318	L1220	GLN	H898	S703	L443	P383	S197	R257	S197
E1319	L1221	GLN	H899	W704	D444	R384	H198	K258	S197
I1323	L1222	ASP	V967	L715	A446	R385	Q199	Q260	Q199
V1330	L1223	THR	R985	A719	A447	R386	L200	H261	L200
E1339	L1224	THR	R986	K724	A448	S387	V201	V282	V201
D1340	L1225	THR	R987	E725	A449	R388	D202	F283	D202
V1343	L1226	THR	D987	D726	S450	L390	N203	R264	N203
F1344	L1227	THR	Y988	R727	G454	C394	P204	R265	P204
Y1345	L1228	THR	Y988	D728	S455	T395	G205	T266	G205
M1346	L1229	THR	R989	Y733	I456	T397	C206	T267	C206
D1347	L1230	THR	R989	Y733	I457	T397	N207	G288	N207
S1350	Q1231	THR	C992	L737	G458	H392	N210	G288	N210
I1355	Q1232	THR	R985	E614	I458	L393	N211	S271	N211
Q1356	L1233	THR	R986	E614	I459	L393	V212	T276	V212
M1357	M1234	THR	R987	E614	K459	V399	N213	S277	N213
S1360	L1235	THR	D987	E614	L460	H400	C214	S278	C214
E1361	L1236	THR	Y988	E614	L460	H400	N215	K279	N215
D1347	L1237	THR	R989	E614	L460	H400	T216	K279	T216
Q1347	L1238	THR	R989	E614	L460	H400	S217	A280	S217
S1350	L1239	THR	C992	E614	L460	H400	K218	L281	K218
Q1242	Q1242	THR	Y996	E614	L460	H400	K219	L281	K219
M1243	L1243	THR	R985	E614	L460	H400	L220	V284	L220
F1244	L1244	THR	R986	E614	L460	H400	V221	E285	V221
C1245	L1245	THR	D987	E614	L460	H400	L222	V286	L222
G1247	L1246	THR	Y988	E614	L460	H400	F223	V286	F223
M1248	L1247	THR	Y988	E614	L460	H400	K224	V286	K224
Q1249	L1248	THR	Y988	E614	L460	H400	K225	V286	K225
Q1250	L1249	THR	Y988	E614	L460	H400	D290	V286	D290
M1251	L1250	THR	Y988	E614	L460	H400	P291	V286	P291
L1255	L1251	THR	Y988	E614	L460	H400	C292	V286	C292
H1258	L1252	THR	Y988	E614	L460	H400	R293	V286	R293
M1260	L1253	THR	Y988	E614	L460	H400	G294	V286	G294
L1261	L1254	THR	Y988	E614	L460	H400	C295	V286	C295
A1270	L1255	THR	Y988	E614	L460	H400	D290	V286	D290
H1258	L1256	THR	Y988	E614	L460	H400	L234	V286	L234
M1260	L1257	THR	Y988	E614	L460	H400	E360	V286	E360
S1191	L1258	THR	Y988	E614	L460	H400	G361	V286	G361
A1192	L1259	THR	Y988	E614	L460	H400	N362	V286	N362
S1193	L1260	THR	Y988	E614	L460	H400	D363	V286	D363
V1194	L1261	THR	Y988	E614	L460	H400	L364	V286	L364
K1195	L1262	THR	Y988	E614	L460	H400	F303	V286	F303
K1196	L1263	THR	Y988	E614	L460	H400	L365	V286	L365
S1197	L1264	THR	Y988	E614	L460	H400	G366	V286	G366
R1198	L1265	THR	Y988	E614	L460	H400	L367	V286	L367
R1203	L1266	THR	Y988	E614	L460	H400	F368	V286	F368
V1199	L1267	THR	Y988	E614	L460	H400	A428	V286	A428
V1199	L1268	THR	Y988	E614	L460	H400	A429	V286	A429
F1281	L1269	THR	Y988	E614	L460	H400	F430	V286	F430
Q1274	L1270	THR	Y988	E614	L460	H400	A431	V286	A431
M1279	L1271	THR	Y988	E614	L460	H400	L370	V286	L370
M1280	L1272	THR	Y988	E614	L460	H400	D371	V286	D371
F1281	L1273	THR	Y988	E614	L460	H400	E246	V286	E246
Q1282	L1274	THR	Y988	E614	L460	H400	Q247	V286	Q247
L1283	L1275	THR	Y988	E614	L460	H400		V286	
G1284	L1276	THR	Y988	E614	L460	H400		V286	
S1285	L1277	THR	Y988	E614	L460	H400		V286	
E1285	L1278	THR	Y988	E614	L460	H400		V286	
M1286	L1279	THR	Y988	E614	L460	H400		V286	
M1286	L1280	THR	Y988	E614	L460	H400		V286	
C1384	L1281	THR	Y988	E614	L460	H400		V286	
T1385	L1282	THR	Y988	E614	L460	H400		V286	
K1395	L1283	THR	Y988	E614	L460	H400		V286	
C1395	L1284	THR	Y988	E614	L460	H400		V286	
M1397	L1285	THR	Y988	E614	L460	H400		V286	
	L1286	THR	Y988	E614	L460	H400		V286	
	L1287	THR	Y988	E614	L460	H400		V286	

L1400	L1401	L1402	D1403	D1404	D1413	T1420	A1421	N1424	F1425	H1428	D1432	T1433	E1434	V1435	K1438	E1439	T1440	Y1441	T1442	S1443	N1444	N1452	F1453	L1454	C1458	R1459	A1460	C1461	T1464	S1472	I1473	L1474	E1475	K1476	Y1477	V1478	T1488	F1489	F1490	S1491	S1492	P1493	PHE	SER	ASP	GLN	VAL	SER	THR						
THR	LEU	GLN	THR	ARG	GLN	PRO	VAL	PHE	VAL	GLN	LEU	LEU	GLN	GLY	VAL	ASN	PHE	ARG	VAL	TYR	HIS	CYS	ASN	TRP	LEU	MET	PRO	SER	GLN	LYS	ALA	SER	VAL	GLU	SER	CYS	ILE	ARG	VAL	LEU	SER	ASP	VAL	ALA	ALA	ILE	PRO	VAL	ASP	LEU	ASP	SER	GLN	VAL	ASN
ASN	LEU	PHE	LEU	SER	HIS	ASN	ILE	VAL	GLN	LYS	THR	ALA	LEU	ASN	TRP	ARG	LEU	SER	ALA	ARG																																			

## 4 Data and refinement statistics i

Property	Value	Source
Space group	P 42	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	128.16Å 128.16Å 369.49Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.81 – 5.81 48.81 – 5.81	Depositor EDS
% Data completeness (in resolution range)	99.9 (48.81-5.81) 99.9 (48.81-5.81)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.85 (at 5.73Å)	Xtrriage
Refinement program	PHENIX (1.10.1_2155: ???)	Depositor
R, $R_{free}$	0.278 , 0.342 0.300 , 0.362	Depositor DCC
$R_{free}$ test set	818 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	88.0	Xtrriage
Anisotropy	0.101	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.22 , 457.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.21$ , $\langle L^2 \rangle = 0.07$	Xtrriage
Estimated twinning fraction	0.368 for h,-k,-l	Xtrriage
$F_o, F_c$ correlation	0.78	EDS
Total number of atoms	17919	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	31.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.62% 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 [i](#)

### 5.1 Standard geometry [i](#)

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	0.66	10/7527 (0.1%)	0.94	41/10362 (0.4%)
1	B	0.67	12/7549 (0.2%)	0.92	39/10390 (0.4%)
All	All	0.66	22/15076 (0.1%)	0.93	80/20752 (0.4%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	7
1	B	0	11
All	All	0	18

The worst 5 of 22 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	430	PHE	CD1-CE1	8.15	1.55	1.39
1	A	160	TRP	CB-CG	-7.67	1.36	1.50
1	B	218	TRP	CE3-CZ3	-7.18	1.26	1.38
1	B	462	LYS	CD-CE	7.14	1.69	1.51
1	A	459	LYS	CD-CE	6.54	1.67	1.51

The worst 5 of 80 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	480	LEU	CB-CG-CD1	-15.76	84.22	111.00
1	B	379	ASP	CB-CG-OD2	12.31	129.38	118.30
1	B	377	GLY	N-CA-C	11.68	142.31	113.10
1	A	416	LEU	CA-CB-CG	11.35	141.40	115.30
1	B	251	LEU	CB-CG-CD2	-10.52	93.12	111.00

There are no chirality outliers.

5 of 18 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	14	ILE	Peptide
1	A	213	ASN	Peptide
1	A	226	TRP	Peptide
1	A	248	GLU	Peptide
1	A	393	LEU	Peptide

## 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	7464	1485	5141	2046	2
1	B	7485	1485	5190	2095	2
All	All	14949	2970	10331	4141	4

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 164.

The worst 5 of 4141 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:A:263:PHE:HB2	1:A:415:MET:CB	1.50	1.38
1:A:32:LEU:CD1	1:A:445:PHE:HA	1.54	1.35
1:B:18:TYR:O	1:B:181:LYS:NZ	1.59	1.32
1:A:456:ILE:C	1:A:459:LYS:HD3	1.51	1.30
1:B:459:LYS:C	1:B:462:LYS:HE3	1.48	1.30

All (4) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:376:ARG:O	1:B:378:GLY:N[2_655]	1.78	0.42
1:A:374:THR:N	1:A:376:ARG:O[2_655]	1.96	0.24
1:B:377:GLY:N	1:B:379:ASP:OD1[2_655]	2.15	0.05
1:A:373:THR:OG1	1:A:376:ARG:O[2_655]	2.16	0.04

## 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	1230/1581 (78%)	1000 (81%)	155 (13%)	75 (6%)	1	16
1	B	1230/1581 (78%)	980 (80%)	165 (13%)	85 (7%)	1	14
All	All	2460/3162 (78%)	1980 (80%)	320 (13%)	160 (6%)	1	15

5 of 160 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	49	PRO
1	A	50	PRO
1	A	104	GLU
1	A	140	ALA
1	A	192	PRO

### 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	376/1427 (26%)	232 (62%)	144 (38%)	0	0
1	B	384/1427 (27%)	210 (55%)	174 (45%)	0	0
All	All	760/2854 (27%)	442 (58%)	318 (42%)	0	0

5 of 318 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	248	GLU

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type
1	B	445	PHE
1	B	259	LYS
1	B	319	ASP
1	B	480	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 31 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	400	HIS
1	B	288	GLN
1	A	562	HIS
1	B	518	GLN
1	B	210	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 [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled '#RSRZ > 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q < 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	1252/1581 (79%)	-0.31	39 (3%) 49 42	8, 28, 64, 150	0
1	B	1252/1581 (79%)	-0.32	49 (3%) 39 34	8, 27, 65, 120	0
All	All	2504/3162 (79%)	-0.32	88 (3%) 44 38	8, 28, 65, 150	0

The worst 5 of 88 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	899	HIS	6.7
1	B	280	ALA	6.6
1	B	27	ILE	4.5
1	A	267	THR	4.5
1	B	1062	ARG	4.2

### 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

### 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 6.4 Ligands [i](#)

There are no ligands in this entry.

### 6.5 Other polymers [i](#)

There are no such residues in this entry.