



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 18, 2026 – 04:49 AM UTC

PDB ID : 8TS8 / pdb_00008ts8
Title : p85alpha/p110alpha heterodimer H1047R mutant
Authors : Holliday, M.; Tang, Y.; Bulku, A.; Wilbur, J.; Fraser, J.
Deposited on : 2023-08-11
Resolution : 2.72 Å(reported)

This is a Full wwPDB X-ray Structure Validation 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 ⓘ 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:

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

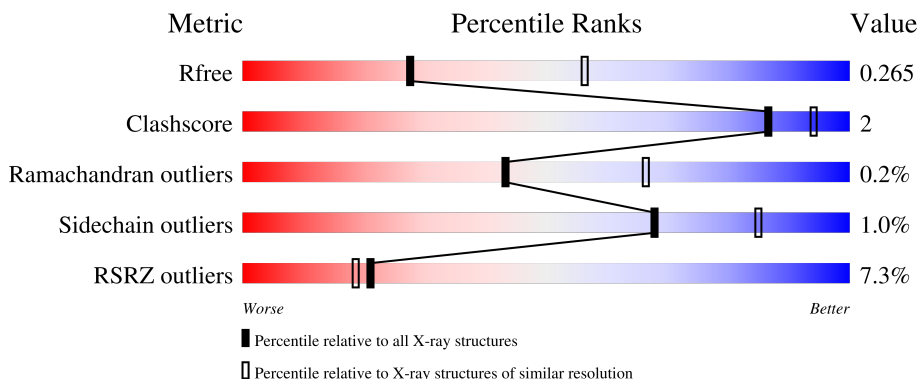
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.72 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	4348 (2.74-2.70)
Clashscore	190562	4665 (2.74-2.70)
Ramachandran outliers	187476	4584 (2.74-2.70)
Sidechain outliers	187428	4585 (2.74-2.70)
RSRZ outliers	180081	4348 (2.74-2.70)

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 $\leq 5\%$. 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	1063	
2	B	300	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 20722 atoms, of which 10378 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 Phosphatidylinositol 4,5-bisphosphate 3-kinase catalytic subunit alpha isoform.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	992	Total	C	H	N	O	S	32	0	0
			16280	5194	8162	1389	1467	68			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-9	GLY	-	expression tag	UNP P42336
A	-8	SER	-	expression tag	UNP P42336
A	-7	PRO	-	expression tag	UNP P42336
A	-6	GLY	-	expression tag	UNP P42336
A	-5	ILE	-	expression tag	UNP P42336
A	-4	SER	-	expression tag	UNP P42336
A	-3	GLY	-	expression tag	UNP P42336
A	-2	GLY	-	expression tag	UNP P42336
A	-1	GLY	-	expression tag	UNP P42336
A	0	GLY	-	expression tag	UNP P42336
A	1	GLY	-	expression tag	UNP P42336
A	1047	ARG	HIS	engineered mutation	UNP P42336

- Molecule 2 is a protein called Phosphatidylinositol 3-kinase regulatory subunit alpha.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
2	B	262	Total	C	H	N	O	S	29	0	0
			4442	1397	2216	397	425	7			

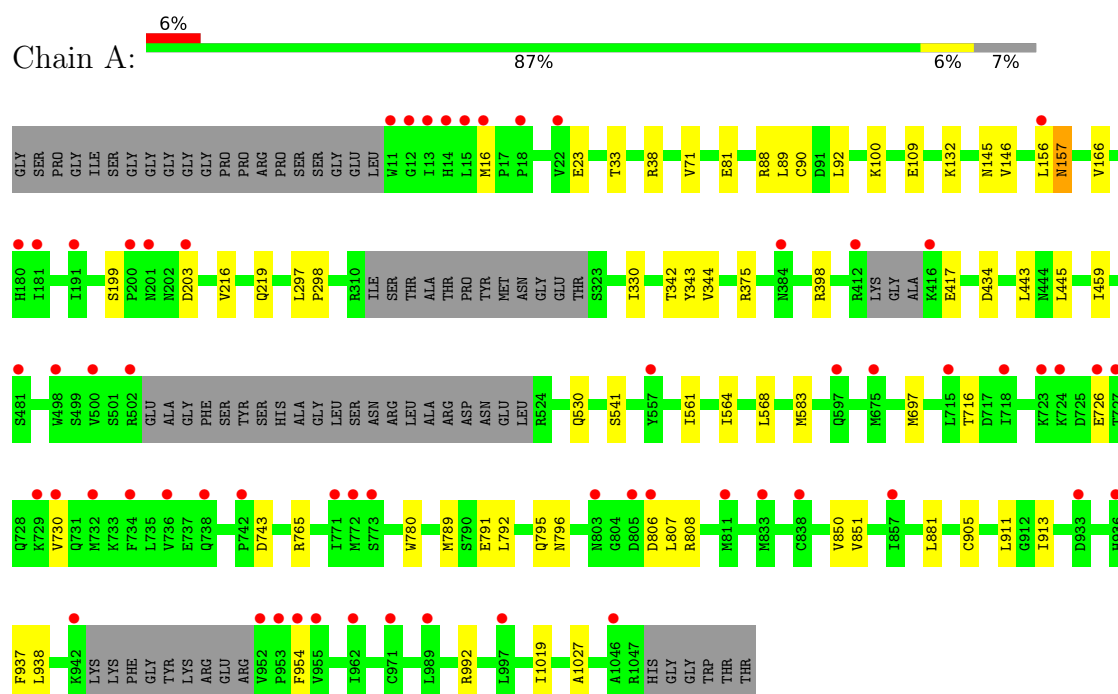
There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	316	GLY	-	expression tag	UNP P27986
B	317	PRO	-	expression tag	UNP P27986

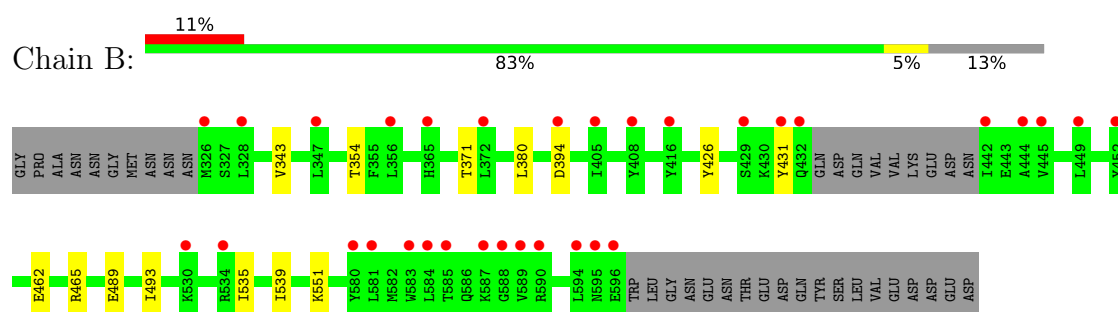
3 Residue-property plots

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: Phosphatidylinositol 4,5-bisphosphate 3-kinase catalytic subunit alpha isoform



- Molecule 2: Phosphatidylinositol 3-kinase regulatory subunit alpha



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	85.22Å 121.00Å 191.03Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	95.52 – 2.72 95.52 – 2.72	Depositor EDS
% Data completeness (in resolution range)	93.6 (95.52-2.72) 93.6 (95.52-2.72)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.34 (at 2.73Å)	Xtriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.225 , 0.265 0.226 , 0.265	Depositor DCC
R_{free} test set	2520 reflections (4.69%)	wwPDB-VP
Wilson B-factor (Å ²)	65.6	Xtriage
Anisotropy	0.217	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 42.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	20722	wwPDB-VP
Average B, all atoms (Å ²)	83.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.19% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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	0.10	0/8296	0.27	0/11208
2	B	0.10	0/2263	0.27	0/3027
All	All	0.10	0/10559	0.27	0/14235

There are no bond length outliers.

There are no bond angle outliers.

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	8118	8162	8156	37	0
2	B	2226	2216	2214	6	0
All	All	10344	10378	10370	43	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 2.

All (43) 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:16:MET:HE1	1:A:89:LEU:HD22	1.71	0.72
1:A:992:ARG:NH1	1:A:1027:ALA:O	2.33	0.61

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:765:ARG:NH1	1:A:796:ASN:OD1	2.35	0.59
1:A:398:ARG:NH1	1:A:434:ASP:OD1	2.39	0.56
1:A:166:VAL:HG11	1:A:297:LEU:HD22	1.88	0.56
1:A:109:GLU:N	1:A:109:GLU:OE1	2.43	0.52
1:A:199:SER:OG	1:A:203:ASP:OD1	2.17	0.51
1:A:38:ARG:NH2	1:A:743:ASP:OD2	2.40	0.49
1:A:780:TRP:CH2	1:A:850:VAL:HG21	2.47	0.49
1:A:156:LEU:O	1:A:157:ASN:HB2	2.13	0.48
1:A:16:MET:HE2	1:A:90:CYS:HA	1.95	0.48
1:A:23:GLU:HG2	1:A:33:THR:HG22	1.94	0.48
1:A:166:VAL:HG11	1:A:297:LEU:CD2	2.43	0.48
1:A:443:LEU:HD22	1:A:445:LEU:HD23	1.96	0.48
1:A:342:THR:O	1:A:344:VAL:N	2.46	0.47
1:A:561:ILE:O	1:A:564:ILE:HG22	2.16	0.46
1:A:806:ASP:OD2	1:A:808:ARG:NH1	2.48	0.46
1:A:71:VAL:HG12	1:A:81:GLU:HA	1.98	0.45
1:A:568:LEU:HG	1:A:583:MET:HE1	1.98	0.45
1:A:216:VAL:HG22	1:A:219:GLN:HG3	1.99	0.45
1:A:23:GLU:CG	1:A:33:THR:HG22	2.47	0.44
1:A:459:ILE:HG22	1:A:459:ILE:O	2.17	0.44
1:A:726:GLU:HB3	1:A:730:VAL:HG13	2.00	0.44
2:B:535:ILE:O	2:B:539:ILE:HG23	2.19	0.43
1:A:88:ARG:O	1:A:92:LEU:HD13	2.17	0.43
1:A:791:GLU:HG2	1:A:792:LEU:HD13	2.00	0.43
1:A:911:LEU:HB2	1:A:913:ILE:CD1	2.47	0.43
1:A:905:CYS:HB3	1:A:954:PHE:CZ	2.53	0.43
1:A:937:PHE:CD2	1:A:938:LEU:HG	2.54	0.43
2:B:371:THR:HG22	2:B:380:LEU:CD2	2.49	0.43
1:A:16:MET:HE2	1:A:90:CYS:HB3	2.01	0.42
1:A:71:VAL:HG23	1:A:100:LYS:HB3	2.01	0.42
1:A:145:ASN:OD1	1:A:146:VAL:N	2.53	0.42
1:A:561:ILE:O	1:A:561:ILE:HG23	2.18	0.42
2:B:489:GLU:O	2:B:493:ILE:HD13	2.20	0.42
1:A:298:PRO:HG2	1:A:697:MET:HG2	2.03	0.41
1:A:330:ILE:N	1:A:330:ILE:HD12	2.36	0.41
1:A:789:MET:HE2	1:A:792:LEU:HD22	2.03	0.41
2:B:354:THR:HG22	2:B:426:TYR:HB2	2.02	0.41
1:A:1019:ILE:HG22	1:A:1019:ILE:O	2.21	0.41
2:B:462:GLU:OE1	2:B:465:ARG:NH1	2.50	0.40
1:A:375:ARG:NH1	1:A:417:GLU:OE2	2.44	0.40
2:B:394:ASP:OD1	2:B:394:ASP:N	2.54	0.40

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	982/1063 (92%)	946 (96%)	34 (4%)	2 (0%)	43	66
2	B	258/300 (86%)	251 (97%)	7 (3%)	0	100	100
All	All	1240/1363 (91%)	1197 (96%)	41 (3%)	2 (0%)	43	66

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	157	ASN
1	A	343	TYR

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	912/963 (95%)	904 (99%)	8 (1%)	70	86
2	B	243/277 (88%)	240 (99%)	3 (1%)	63	82
All	All	1155/1240 (93%)	1144 (99%)	11 (1%)	68	85

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	132	LYS

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	530	GLN
1	A	541	SER
1	A	716	THR
1	A	795	GLN
1	A	807	LEU
1	A	851	VAL
1	A	881	LEU
2	B	343	VAL
2	B	431	TYR
2	B	551	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	47	HIS
1	A	362	HIS
1	A	497	ASN
1	A	682	GLN
1	A	917	HIS
1	A	931	HIS
2	B	406	ASN
2	B	415	GLN
2	B	478	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 oligosaccharides 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, 95th 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	992/1063 (93%)	0.49	60 (6%)	27 24	32, 72, 123, 183	3 (0%)
2	B	262/300 (87%)	0.88	32 (12%)	8 8	39, 95, 152, 188	2 (0%)
All	All	1254/1363 (92%)	0.57	92 (7%)	21 18	32, 76, 133, 188	5 (0%)

All (92) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	15	LEU	5.2
2	B	445	VAL	4.8
2	B	587	LYS	4.7
1	A	942	LYS	4.5
1	A	201	ASN	4.3
1	A	11	TRP	4.3
1	A	953	PRO	4.1
1	A	18	PRO	4.0
2	B	594	LEU	4.0
1	A	955	VAL	4.0
1	A	14	HIS	4.0
1	A	500	VAL	3.9
2	B	432	GLN	3.9
1	A	736	VAL	3.8
2	B	589	VAL	3.7
1	A	412	ARG	3.7
1	A	715	LEU	3.7
1	A	181	ILE	3.7
2	B	442	ILE	3.6
2	B	356	LEU	3.6
1	A	1046	ALA	3.5
2	B	431	TYR	3.4
1	A	498	TRP	3.4
1	A	727	THR	3.4

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	13	ILE	3.4
1	A	811	MET	3.4
1	A	718	ILE	3.3
2	B	444	ALA	3.3
2	B	394	ASP	3.2
1	A	180	HIS	3.2
2	B	326	MET	3.1
1	A	557	TYR	3.1
1	A	502	ARG	3.1
1	A	481	SER	3.0
2	B	452	TYR	2.9
1	A	773	SER	2.9
1	A	952	VAL	2.9
1	A	962	ILE	2.9
2	B	595	ASN	2.9
2	B	584	LEU	2.9
2	B	365	HIS	2.9
2	B	596	GLU	2.8
1	A	805	ASP	2.8
1	A	771	ILE	2.8
1	A	22	VAL	2.8
2	B	405	ILE	2.7
1	A	156	LEU	2.7
1	A	833	MET	2.7
1	A	806	ASP	2.7
2	B	530	LYS	2.7
2	B	583	TRP	2.5
1	A	997	LEU	2.5
1	A	772	MET	2.5
1	A	734	PHE	2.5
1	A	723	LYS	2.4
1	A	857	ILE	2.4
1	A	726	GLU	2.4
1	A	933	ASP	2.4
2	B	581	LEU	2.3
1	A	724	LYS	2.3
1	A	12	GLY	2.3
1	A	936	HIS	2.3
1	A	742	PRO	2.3
1	A	416	LYS	2.3
1	A	729	LYS	2.2
1	A	732	MET	2.2

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	597	GLN	2.2
1	A	730	VAL	2.2
1	A	954	PHE	2.2
1	A	838	CYS	2.2
1	A	971	CYS	2.2
2	B	416	TYR	2.2
2	B	429	SER	2.2
2	B	372	LEU	2.2
2	B	408	TYR	2.2
2	B	585	THR	2.2
1	A	675	MET	2.2
1	A	191	ILE	2.2
1	A	200	PRO	2.1
1	A	384	ASN	2.1
2	B	347	LEU	2.1
2	B	588	GLY	2.1
1	A	989	LEU	2.1
1	A	803	ASN	2.1
1	A	738	GLN	2.1
2	B	328	LEU	2.1
2	B	590	ARG	2.0
2	B	449	LEU	2.0
2	B	534	ARG	2.0
1	A	203	ASP	2.0
1	A	16	MET	2.0
2	B	580	TYR	2.0

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 oligosaccharides 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.