



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 04:20 PM UTC

PDB ID : 1N9Z / pdb_00001n9z
Title : INTEGRIN ALPHA M I DOMAIN MUTANT
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Deposited on : 2002-11-26
Resolution : 2.50 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

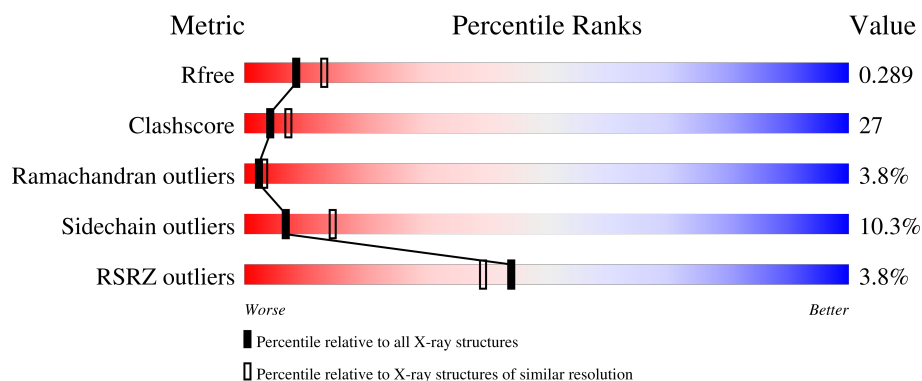
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.50 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	5829 (2.50-2.50)
Clashscore	190562	6492 (2.50-2.50)
Ramachandran outliers	187476	6378 (2.50-2.50)
Sidechain outliers	187428	6380 (2.50-2.50)
RSRZ outliers	180081	5833 (2.50-2.50)

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	192	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	MG	A	400	-	-	-	X

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 1486 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 Integrin alpha-M.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	184	Total	C	N	O	S	117	0	0
			1485	942	265	273	5			

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	128	ALA	CYS	engineered mutation	UNP P11215
A	132	CYS	ASP	engineered mutation	UNP P11215
A	315	CYS	LYS	engineered mutation	UNP P11215

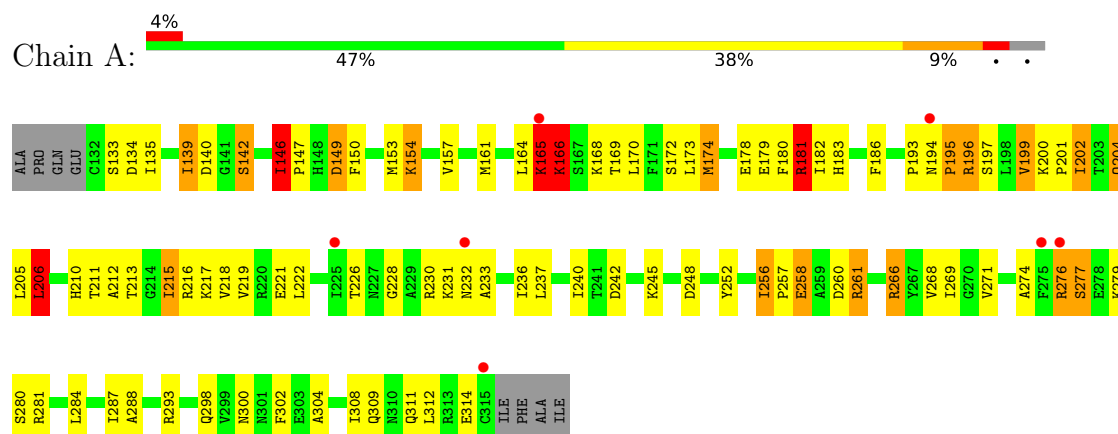
- Molecule 2 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Mg	0	0
			1	1		

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: Integrin alpha-M



4 Data and refinement statistics

Property	Value	Source
Space group	P 43	Depositor
Cell constants a, b, c, α , β , γ	44.22Å 44.22Å 99.91Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 2.50 20.00 – 2.50	Depositor EDS
% Data completeness (in resolution range)	91.6 (20.00-2.50) 91.5 (20.00-2.50)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.74 (at 2.50Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.242 , 0.278 0.246 , 0.289	Depositor DCC
R_{free} test set	347 reflections (5.45%)	wwPDB-VP
Wilson B-factor (Å ²)	20.1	Xtriage
Anisotropy	0.105	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.28 , 41.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.098 for h,-k,-l	Xtriage
F_o, F_c correlation	0.89	EDS
Total number of atoms	1486	wwPDB-VP
Average B, all atoms (Å ²)	21.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.45% 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

Bond lengths and bond angles in the following residue types are not validated in this section: MG

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	1.14	6/1513 (0.4%)	1.32	16/2036 (0.8%)

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	6

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	256	ILE	CA-CB	-21.25	1.39	1.53
1	A	258	GLU	CG-CD	19.33	2.00	1.52
1	A	146	ILE	CB-CG1	12.49	1.78	1.53
1	A	174	MET	SD-CE	-9.06	1.56	1.79
1	A	146	ILE	CB-CG2	8.40	1.80	1.52
1	A	196	ARG	N-CA	-7.88	1.36	1.46

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	146	ILE	CA-CB-CG2	14.64	135.39	110.50
1	A	258	GLU	CB-CG-CD	-14.57	87.83	112.60
1	A	146	ILE	CA-CB-CG1	9.75	126.98	110.40
1	A	215	ILE	CA-CB-CG1	-7.61	97.47	110.40
1	A	258	GLU	CA-CB-CG	-6.83	100.44	114.10
1	A	139	ILE	N-CA-C	6.54	117.32	108.17
1	A	154	LYS	O-C-N	6.04	128.52	122.12

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	146	ILE	CG1-CB-CG2	-5.95	92.85	110.70
1	A	146	ILE	N-CA-C	5.52	120.80	108.88
1	A	199	VAL	N-CA-C	5.48	116.55	111.45
1	A	288	ALA	N-CA-C	5.47	117.78	110.35
1	A	146	ILE	N-CA-CB	5.42	118.81	111.21
1	A	204	GLN	N-CA-C	5.36	118.28	109.76
1	A	293	ARG	NE-CZ-NH2	5.31	123.98	119.20
1	A	181	ARG	NE-CZ-NH2	5.30	123.97	119.20
1	A	149	ASP	O-C-N	-5.26	115.38	122.43

There are no chirality outliers.

All (6) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	166	LYS	Mainchain
1	A	181	ARG	Mainchain
1	A	206	LEU	Mainchain
1	A	261	ARG	Sidechain
1	A	276	ARG	Sidechain
1	A	302	PHE	Mainchain

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	1485	0	1498	73	0
2	A	1	0	0	0	0
All	All	1486	0	1498	73	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 27.

All (73) 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:146:ILE:CB	1:A:146:ILE:CG1	1.78	1.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:146:ILE:CB	1:A:146:ILE:CG2	1.80	1.53
1:A:258:GLU:CD	1:A:258:GLU:CG	2.00	1.33
1:A:194:ASN:ND2	1:A:197:SER:HB2	1.77	1.00
1:A:194:ASN:HD22	1:A:197:SER:HB2	1.33	0.90
1:A:140:ASP:OD1	1:A:142:SER:HB3	1.72	0.90
1:A:258:GLU:CD	1:A:258:GLU:CB	2.52	0.82
1:A:304:ALA:O	1:A:308:ILE:HG12	1.80	0.81
1:A:146:ILE:CG1	1:A:146:ILE:CG2	2.59	0.79
1:A:194:ASN:HD22	1:A:197:SER:CB	1.95	0.78
1:A:146:ILE:HB	1:A:147:PRO:CD	2.15	0.75
1:A:179:GLU:OE1	1:A:181:ARG:NH1	2.21	0.73
1:A:146:ILE:CB	1:A:146:ILE:CD1	2.67	0.72
1:A:205:LEU:O	1:A:206:LEU:HB2	1.92	0.69
1:A:194:ASN:ND2	1:A:197:SER:CB	2.52	0.68
1:A:183:HIS:CD2	1:A:202:ILE:HG12	2.30	0.66
1:A:165:LYS:O	1:A:166:LYS:C	2.40	0.64
1:A:268:VAL:HG11	1:A:284:LEU:HD22	1.77	0.64
1:A:277:SER:HB3	1:A:280:SER:OG	2.00	0.62
1:A:172:SER:OG	1:A:222:LEU:HD13	2.00	0.61
1:A:260:ASP:OD1	1:A:266:ARG:NH2	2.33	0.61
1:A:200:LYS:HB3	1:A:201:PRO:HD3	1.83	0.61
1:A:268:VAL:CG1	1:A:284:LEU:HD22	2.31	0.60
1:A:154:LYS:HD2	1:A:199:VAL:HG12	1.83	0.60
1:A:135:ILE:HD13	1:A:169:THR:HG23	1.84	0.59
1:A:298:GLN:CD	1:A:300:ASN:H	2.11	0.58
1:A:154:LYS:HD2	1:A:199:VAL:CG1	2.35	0.56
1:A:210:HIS:HA	1:A:248:ASP:HB2	1.86	0.56
1:A:149:ASP:O	1:A:153:MET:HG3	2.06	0.56
1:A:179:GLU:OE1	1:A:205:LEU:HD22	2.06	0.55
1:A:231:LYS:C	1:A:233:ALA:H	2.15	0.55
1:A:266:ARG:HD2	1:A:287:ILE:O	2.07	0.55
1:A:135:ILE:N	1:A:135:ILE:HD12	2.21	0.55
1:A:170:LEU:HG	1:A:230:ARG:HH21	1.72	0.55
1:A:182:ILE:HG23	1:A:222:LEU:HD21	1.90	0.54
1:A:150:PHE:CD1	1:A:204:GLN:HG3	2.43	0.54
1:A:135:ILE:HG13	1:A:236:ILE:HB	1.90	0.53
1:A:146:ILE:CG2	1:A:146:ILE:HG13	2.39	0.53
1:A:186:PHE:HB2	1:A:228:GLY:HA3	1.90	0.52
1:A:146:ILE:HG13	1:A:146:ILE:HG21	1.90	0.52
1:A:164:LEU:O	1:A:165:LYS:C	2.54	0.50
1:A:135:ILE:HD13	1:A:169:THR:CG2	2.42	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:153:MET:HE3	1:A:271:VAL:HG21	1.94	0.49
1:A:173:LEU:HD23	1:A:174:MET:N	2.28	0.49
1:A:213:THR:O	1:A:217:LYS:HG3	2.13	0.49
1:A:204:GLN:NE2	1:A:206:LEU:CD1	2.76	0.48
1:A:218:VAL:HG11	1:A:237:LEU:HD13	1.94	0.48
1:A:277:SER:O	1:A:281:ARG:HG3	2.13	0.48
1:A:153:MET:O	1:A:157:VAL:HG23	2.15	0.47
1:A:256:ILE:N	1:A:257:PRO:CD	2.77	0.47
1:A:157:VAL:O	1:A:161:MET:HG3	2.14	0.47
1:A:245:LYS:HD3	1:A:252:TYR:CZ	2.50	0.47
1:A:179:GLU:CD	1:A:205:LEU:HD22	2.40	0.46
1:A:242:ASP:O	1:A:274:ALA:HA	2.16	0.46
1:A:240:ILE:HG12	1:A:269:ILE:HB	1.98	0.46
1:A:180:PHE:CD2	1:A:180:PHE:N	2.84	0.45
1:A:157:VAL:HG12	1:A:161:MET:HE2	1.99	0.44
1:A:240:ILE:HA	1:A:269:ILE:O	2.18	0.43
1:A:231:LYS:O	1:A:233:ALA:N	2.52	0.43
1:A:174:MET:HG3	1:A:181:ARG:C	2.43	0.43
1:A:140:ASP:HB3	1:A:153:MET:HE1	1.99	0.43
1:A:193:PRO:O	1:A:195:PRO:HD3	2.19	0.42
1:A:134:ASP:HB3	1:A:186:PHE:CZ	2.54	0.42
1:A:146:ILE:HB	1:A:147:PRO:HD2	1.99	0.42
1:A:150:PHE:CE1	1:A:204:GLN:HG3	2.55	0.42
1:A:216:ARG:O	1:A:219:VAL:HG22	2.20	0.42
1:A:212:ALA:HA	1:A:215:ILE:HD12	2.01	0.41
1:A:217:LYS:O	1:A:221:GLU:HB2	2.19	0.41
1:A:231:LYS:C	1:A:233:ALA:N	2.78	0.41
1:A:202:ILE:H	1:A:202:ILE:HG13	1.62	0.41
1:A:139:ILE:O	1:A:139:ILE:HG13	2.20	0.41
1:A:211:THR:O	1:A:215:ILE:HG13	2.21	0.40
1:A:258:GLU:CG	1:A:258:GLU:O	2.68	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	182/192 (95%)	160 (88%)	15 (8%)	7 (4%)	2 3

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	165	LYS
1	A	166	LYS
1	A	202	ILE
1	A	195	PRO
1	A	311	GLN
1	A	277	SER
1	A	232	ASN

5.3.2 Protein sidechains ⓘ

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	165/171 (96%)	148 (90%)	17 (10%)	7 14

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	133	SER
1	A	142	SER
1	A	146	ILE
1	A	165	LYS
1	A	168	LYS
1	A	178	GLU
1	A	181	ARG
1	A	196	ARG
1	A	206	LEU
1	A	226	THR
1	A	261	ARG
1	A	266	ARG

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Mol	Chain	Res	Type
1	A	276	ARG
1	A	279	LYS
1	A	309	GLN
1	A	312	LEU
1	A	314	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	163	GLN
1	A	183	HIS
1	A	194	ASN
1	A	285	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 1 ligands modelled in this entry, 1 is 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 [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, 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	183/192 (95%)	0.28	7 (3%)	44 39	2, 17, 32, 52	47 (25%)

All (7) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	232	ASN	5.6
1	A	165	LYS	2.8
1	A	276	ARG	2.7
1	A	194	ASN	2.6
1	A	275	PHE	2.3
1	A	225	ILE	2.2
1	A	315	CYS	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](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 0.9’ lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	MG	A	400	1/1	0.17	1.31	23,23,23,23	0

6.5 Other polymers [i](#)

There are no such residues in this entry.