W O R L D W I D E
wwPDB
PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

Sep 26, 2023 – 10:58 PM EDT

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PDB ID	:	6BZD
Title	:	Structure of 14-3-3 gamma R57E mutant bound to GlcNAcylated peptide
Authors	:	Schumacher, M.A.
Deposited on	:	2017-12-22
Resolution	:	2.67 Å(reported)

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 2.67 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.
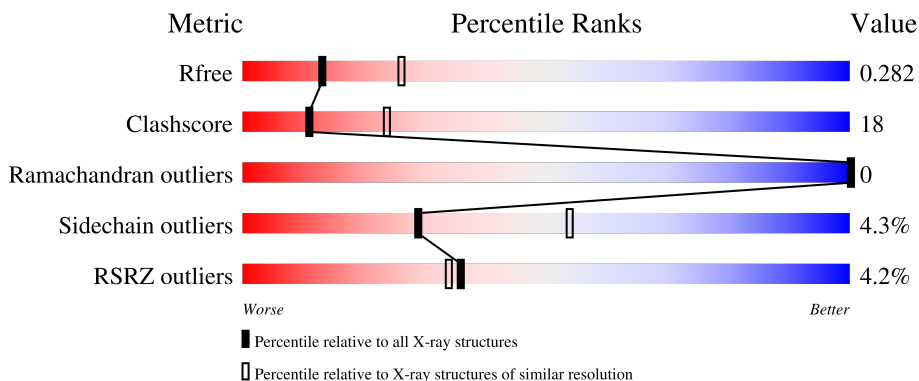
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	3863 (2.70-2.66)
Clashscore	141614	4210 (2.70-2.66)
Ramachandran outliers	138981	4141 (2.70-2.66)
Sidechain outliers	138945	4141 (2.70-2.66)
RSRZ outliers	127900	3780 (2.70-2.66)

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	246	3% 67% 28% · ·
1	B	246	.% 70% 24% · ·
1	C	246	2% 63% 31% · ·
1	D	246	2% 66% 27% · 5%
2	G	20	50% 10% 35% 10% 45%

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Mol	Chain	Length	Quality of chain
2	K	20	

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
3	NAG	G	601	-	-	X	X
3	NAG	K	601	-	-	X	X

2 Entry composition ⓘ

There are 4 unique types of molecules in this entry. The entry contains 7889 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 14-3-3 protein gamma.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	238	Total	C	N	O	S	0	0	0
			1921	1196	325	391	9			
1	B	237	Total	C	N	O	S	0	0	0
			1913	1192	324	388	9			
1	C	237	Total	C	N	O	S	0	0	0
			1913	1192	324	388	9			
1	D	233	Total	C	N	O	S	0	0	0
			1883	1175	318	381	9			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	57	GLU	ARG	engineered mutation	UNP P61981
B	57	GLU	ARG	engineered mutation	UNP P61981
C	57	GLU	ARG	engineered mutation	UNP P61981
D	57	GLU	ARG	engineered mutation	UNP P61981

- Molecule 2 is a protein called GlcNAcylated peptide.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	G	11	Total	C	N	O	0	0	0
			74	44	12	18			
2	K	11	Total	C	N	O	0	0	0
			74	44	12	18			

- Molecule 3 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).
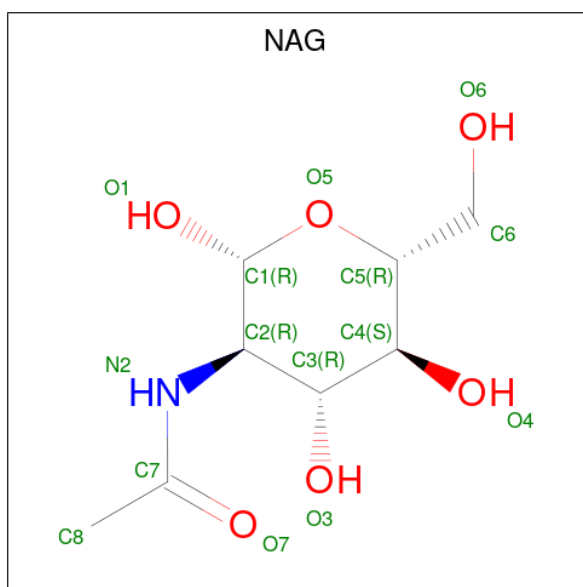
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	G	1	Total 14	C 8	N 1	O 5	0	0
3	K	1	Total 14	C 8	N 1	O 5	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	27	Total 27	O 27	0	0
4	B	34	Total 34	O 34	0	0
4	C	9	Total 9	O 9	0	0
4	D	13	Total 13	O 13	0	0

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: 14-3-3 protein gamma

Chain A:

- Molecule 1: 14-3-3 protein gamma

Chain B:

- Molecule 1: 14-3-3 protein gamma

Chain C:

E191 D203 A204 I205 L208 Y216 K217 D218 S219 T220 L221 I222 M223 Q224 L225 L226 R227 L232 S235 Q238 ASP ASP ASP GLY GLY GLU GLY ASN ASN

• Molecule 1: 14-3-3 protein gamma

Chain D:

2%			
	66%	27%	5%

V2 D3 R4 E5 Q6 L7 V8 Q9 L13 Y20 D21 A26 T31 E35 P36 L37 S38 N39 E40 E41 R42 A48 Y49 K50 N51 V52 S58 S59 W60 R61 V62 I66 E67 T70 D73 GLY ASN GLU LYS K78 M81 V82 R83 R86 E87 E90 K91

E94 A95 V96 C97 Q98 D99 V100 L101 L104 L108 E114 E118 V121 F122 K125 D129 Y130 Y131 R132 Y133 V137 A138 T139 R143 V146 V147 S150 E156 I160 H169 P170 N178 Y179 E191 S215 Y216 K217 D218 S219 T220 L221 I222

M223 Q224 R227 L232 Q237 Q238 ASP ASP ASP GLY GLY GLU GLY ASN ASN

• Molecule 2: GlcNAcylated peptide

Chain G:

	50%		
10%	35%	10%	45%

THR SER THR ALA T501 P502 P503 V504 S505 Q506 A507 S508 S509 T510 T511 THR SER THR TRP

• Molecule 2: GlcNAcylated peptide

Chain K:

	45%		
5%	45%	5%	45%

THR SER THR ALA T501 P502 P503 V504 S505 Q506 A507 S508 S509 T510 T511 THR SER THR TRP

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants	76.37Å 60.00Å 125.79Å	Depositor
a, b, c, α, β, γ	90.00° 90.50° 90.00°	
Resolution (Å)	65.02 – 2.67	Depositor
	65.02 – 2.16	EDS
% Data completeness	95.8 (65.02-2.67)	Depositor
(in resolution range)	86.3 (65.02-2.16)	EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.04	Depositor
$< I/\sigma(I) >$ [1]	2.00 (at 2.16Å)	Xtriage
Refinement program	PHENIX 1.8.4_1496	Depositor
R, R_{free}	0.246 , 0.281	Depositor
	0.246 , 0.282	DCC
R_{free} test set	2005 reflections (3.69%)	wwPDB-VP
Wilson B-factor (Å^2)	50.0	Xtriage
Anisotropy	0.272	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 38.0	EDS
L-test for twinning[2]	$< |L| > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.440 for h,-k,-l	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	7889	wwPDB-VP
Average B, all atoms (Å^2)	72.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 23.23 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 4.8622e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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[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 ⓘ

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

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	0.21	0/1949	0.36	0/2631
1	B	0.21	0/1941	0.35	0/2620
1	C	0.20	0/1941	0.35	0/2620
1	D	0.20	0/1910	0.35	0/2578
2	G	0.81	0/75	1.73	2/104 (1.9%)
2	K	1.25	0/75	1.45	0/104
All	All	0.25	0/7891	0.42	2/10657 (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})
2	G	503	PRO	CA-N-CD	-5.88	103.27	111.50
2	G	504	VAL	CB-CA-C	-5.85	100.29	111.40

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	1921	0	1875	82	0
1	B	1913	0	1872	86	0
1	C	1913	0	1872	62	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	D	1883	0	1843	59	0
2	G	74	0	70	26	0
2	K	74	0	70	18	0
3	G	14	0	12	14	0
3	K	14	0	13	29	0
4	A	27	0	0	9	0
4	B	34	0	0	5	0
4	C	9	0	0	4	0
4	D	13	0	0	8	0
All	All	7889	0	7627	280	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 18.

The worst 5 of 280 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:225:LEU:HD22	2:K:504:VAL:CG1	1.61	1.28
1:B:132:ARG:HH12	3:K:601:NAG:H4	1.08	1.14
1:B:132:ARG:HH12	3:K:601:NAG:C4	1.61	1.12
1:B:112:CYS:SG	4:B:332:HOH:O	2.10	1.09
1:B:185:GLU:OE2	2:K:503:PRO:HG2	1.52	1.08

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	236/246 (96%)	233 (99%)	3 (1%)	0	100	100
1	B	235/246 (96%)	230 (98%)	5 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	235/246 (96%)	217 (92%)	18 (8%)	0	100	100
1	D	229/246 (93%)	205 (90%)	24 (10%)	0	100	100
2	G	9/20 (45%)	4 (44%)	5 (56%)	0	100	100
2	K	9/20 (45%)	8 (89%)	1 (11%)	0	100	100
All	All	953/1024 (93%)	897 (94%)	56 (6%)	0	100	100

There are no Ramachandran outliers to report.

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	210/215 (98%)	203 (97%)	7 (3%)	38	64
1	B	209/215 (97%)	201 (96%)	8 (4%)	33	59
1	C	209/215 (97%)	199 (95%)	10 (5%)	25	49
1	D	206/215 (96%)	199 (97%)	7 (3%)	37	63
2	G	10/18 (56%)	8 (80%)	2 (20%)	1	3
2	K	10/18 (56%)	7 (70%)	3 (30%)	0	0
All	All	854/896 (95%)	817 (96%)	37 (4%)	29	54

5 of 37 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	139	THR
2	K	508	SER
1	D	179	TYR
2	G	506	GLN
1	B	99	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 23 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	224	GLN
1	D	29	ASN
1	D	16	GLN
1	D	68	GLN
1	B	6	GLN

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 monosaccharides in this entry.

5.6 Ligand geometry ⓘ

2 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#|Z| > 2$	Counts	RMSZ	$\#|Z| > 2$
3	NAG	G	601	2	14,14,15	0.85	1 (7%)	17,19,21	1.02	0
3	NAG	K	601	2	14,14,15	0.85	1 (7%)	17,19,21	1.01	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	NAG	G	601	2	-	0/6/23/26	0/1/1/1
3	NAG	K	601	2	-	0/6/23/26	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	K	601	NAG	C1-C2	2.07	1.55	1.52
3	G	601	NAG	C1-C2	2.06	1.55	1.52

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 43 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	G	601	NAG	14	0
3	K	601	NAG	29	0

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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(Å²)	Q<0.9
1	A	238/246 (96%)	-0.12	8 (3%)	45	44	35, 56, 107, 148	0
1	B	237/246 (96%)	-0.16	3 (1%)	77	78	36, 56, 101, 132	0
1	C	237/246 (96%)	0.20	6 (2%)	57	57	55, 76, 115, 145	0
1	D	233/246 (94%)	0.19	5 (2%)	63	63	58, 76, 114, 134	0
2	G	11/20 (55%)	4.48	10 (90%)	0	0	109, 125, 141, 142	0
2	K	11/20 (55%)	3.56	9 (81%)	0	0	113, 124, 144, 149	0
All	All	967/1024 (94%)	0.12	41 (4%)	36	34	35, 69, 120, 149	0

The worst 5 of 41 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	K	501	THR	7.7
2	G	511	THR	6.7
2	G	502	PRO	6.4
2	G	509	SER	6.3
2	G	505	SER	6.0

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 ⓘ

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
3	NAG	K	601	14/15	0.45	0.77	126,145,151,152	0
3	NAG	G	601	14/15	0.58	0.88	126,145,151,152	0

6.5 Other polymers ⓘ

There are no such residues in this entry.