Full wwPDB X-ray Structure Validation Report (i)

Jun 19, 2024 – 03:56 AM EDT

PDB ID	:	4HRM
Title	:	Structural Basis for Eliciting a Cytotoxic Effect in HER2-Overexpressing Cancer Cells via Binding to the Extracellular Domain of HER2
Authors	:	Jost, C.; Schilling, J.; Plueckthun, A.
Deposited on	:	2012-10-28
Resolution	:	3.20 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 (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:

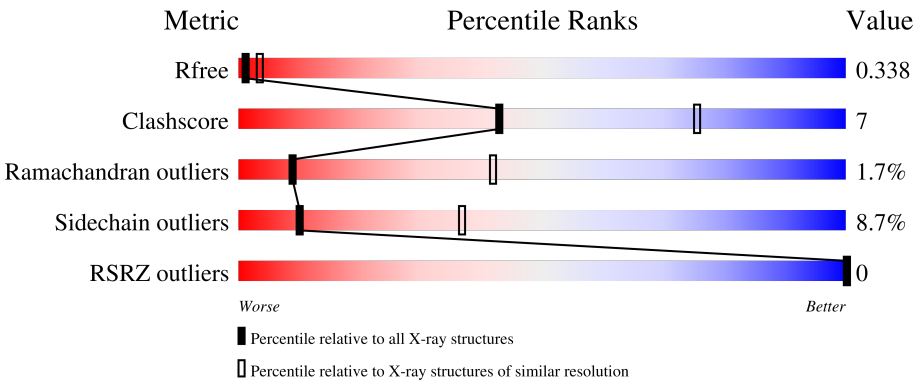
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.20.1
EDS	:	2.37.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

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 3.20 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	1133 (3.20-3.20)
Clashscore	141614	1253 (3.20-3.20)
Ramachandran outliers	138981	1234 (3.20-3.20)
Sidechain outliers	138945	1233 (3.20-3.20)
RSRZ outliers	127900	1095 (3.20-3.20)

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	198	55% 13% • 30%
1	C	198	67% 14% • 16%
2	B	172	63% 8% • 28%
2	D	172	56% 11% • 31%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 3517 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 Domain I of receptor tyrosine-protein kinase erbB-2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	C	166	1123	708	192	215	8	0	0	0
			Total	C	N	O	S			
1	A	139	905	570	158	173	4	0	0	0

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	1	HIS	-	expression tag	UNP P04626
C	46	ASP	ASN	engineered mutation	UNP P04626
C	102	ASP	ASN	engineered mutation	UNP P04626
C	165	ASP	ASN	engineered mutation	UNP P04626
C	198	ALA	-	expression tag	UNP P04626
A	1	HIS	-	expression tag	UNP P04626
A	46	ASP	ASN	engineered mutation	UNP P04626
A	102	ASP	ASN	engineered mutation	UNP P04626
A	165	ASP	ASN	engineered mutation	UNP P04626
A	198	ALA	-	expression tag	UNP P04626

- Molecule 2 is a protein called Designed Ankyrin Repeat Protein 9_26.

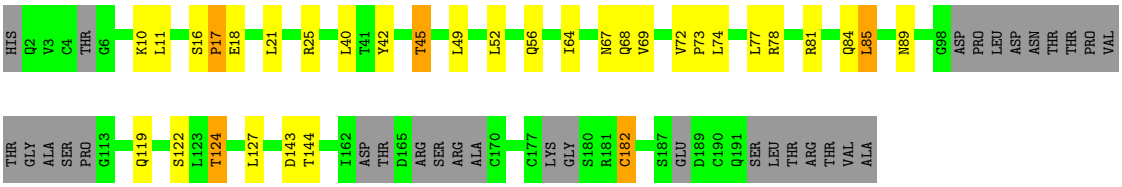
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	B	123	758	468	142	148	0	0	0
			Total	C	N	O			
2	D	119	731	451	137	143	0	0	0

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.

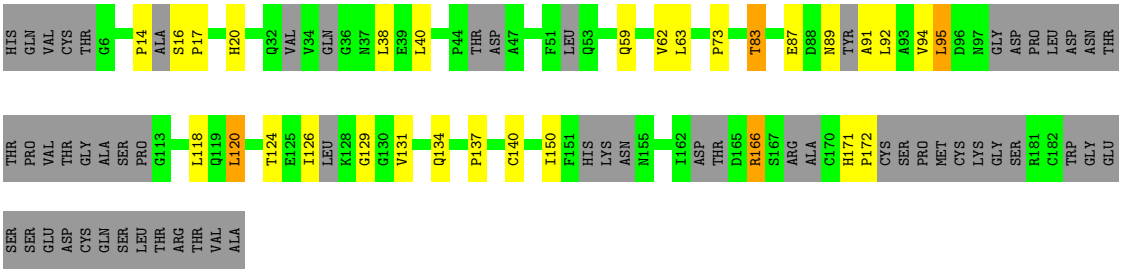
• Molecule 1: Domain I of receptor tyrosine-protein kinase erbB-2

Chain C:



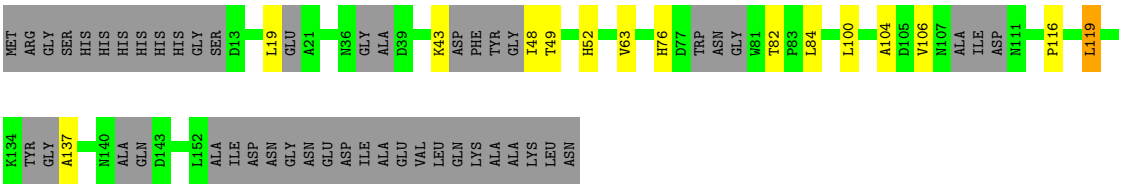
• Molecule 1: Domain I of receptor tyrosine-protein kinase erbB-2

Chain A:



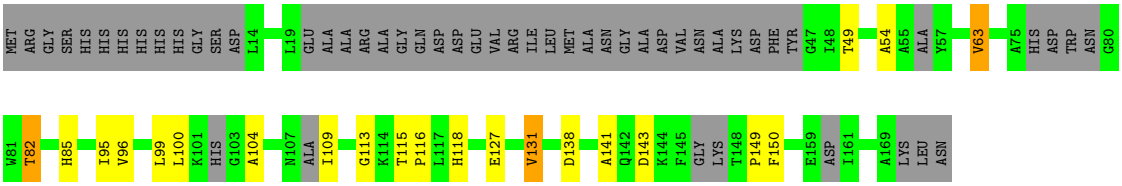
• Molecule 2: Designed Ankyrin Repeat Protein 9_26

Chain B:



• Molecule 2: Designed Ankyrin Repeat Protein 9_26

Chain D:


MET
ARG
GLY
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HIS
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ASP
L14
L19
GLU
ALA
ALA
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ALA
ASP
VAL
ASN
ALA
LYS
ASP
PHE
TYR
G47
I48
T49
A54
A55
ALA
Y57
V63
A75
HIS
ASP
TRP
ASN
G80
W81
T82
H85
I95
V96
L99
L100
K101
HIS
G103
A104
N107
ALA
I109
G113
K114
T115
P116
L117
H118
E127
V131
D138
A141
Q142
D143
K144
F145
GLY
LYS
T148
P149
F150
E159
ASP
I161
A169
LYS
LEU
ASN

4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	138.50Å 60.70Å 107.20Å 90.00° 118.90° 90.00°	Depositor
Resolution (Å)	43.12 – 3.20 43.12 – 3.20	Depositor EDS
% Data completeness (in resolution range)	97.5 (43.12-3.20) 97.6 (43.12-3.20)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	5.06 (at 3.19Å)	Xtriage
Refinement program	PHENIX 1.8_1069	Depositor
R, R_{free}	0.314 , 0.339 0.316 , 0.338	Depositor DCC
R_{free} test set	623 reflections (4.87%)	wwPDB-VP
Wilson B-factor (Å^2)	45.6	Xtriage
Anisotropy	0.611	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.27 , 112.8	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.79	EDS
Total number of atoms	3517	wwPDB-VP
Average B, all atoms (Å^2)	48.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.08% 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 (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	0.27	0/907	0.44	0/1233
1	C	0.27	0/1133	0.50	1/1549 (0.1%)
2	B	0.26	0/761	0.39	0/1043
2	D	0.30	0/735	0.40	0/1006
All	All	0.27	0/3536	0.44	1/4831 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	17	PRO	N-CA-CB	6.12	110.64	103.30

There are no chirality outliers.

There are no planarity outliers.

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	905	0	713	12	0
1	C	1123	0	959	16	0
2	B	758	0	602	6	0
2	D	731	0	574	10	0
All	All	3517	0	2848	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 7.

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)
2:B:49:THR:OG1	2:B:52:HIS:ND1	2.28	0.66
1:A:87:GLU:O	1:A:89:ASN:ND2	2.31	0.64
1:C:85:LEU:HD23	1:C:89:ASN:HA	1.82	0.62
1:A:14:PRO:O	1:A:16:SER:N	2.34	0.61
1:A:92:LEU:HB3	1:A:131:VAL:HG12	1.83	0.61
1:C:67:ASN:HB3	1:C:69:VAL:HG22	1.83	0.60
1:C:143:ASP:OD1	1:C:143:ASP:N	2.33	0.60
1:A:59:GLN:O	1:A:83:THR:OG1	2.19	0.59
1:C:124:THR:O	1:C:124:THR:OG1	2.19	0.58
2:D:115:THR:O	2:D:118:HIS:N	2.34	0.55
2:D:109:ILE:HG13	2:D:113:GLY:HA2	1.89	0.55
2:B:116:PRO:HA	2:B:119:LEU:HD12	1.88	0.55
1:C:81:ARG:O	1:C:127:LEU:HB2	2.07	0.54
2:B:100:LEU:HA	2:B:104:ALA:HB3	1.90	0.53
1:A:118:LEU:HB3	1:A:120:LEU:HG	1.91	0.53
2:D:54:ALA:HB1	2:D:63:VAL:HG12	1.90	0.51
2:D:143:ASP:OD1	2:D:143:ASP:N	2.43	0.51
2:D:138:ASP:HB3	2:D:141:ALA:HB2	1.92	0.51
2:D:82:THR:OG1	2:D:85:HIS:ND1	2.44	0.50
1:A:137:PRO:O	1:A:166:ARG:HA	2.12	0.50
1:A:126:ILE:N	1:A:150:ILE:O	2.45	0.50
2:B:84:LEU:HD23	2:B:116:PRO:HG2	1.95	0.49
1:C:42:TYR:HD1	1:A:17:PRO:HD2	1.77	0.49
2:D:100:LEU:HA	2:D:104:ALA:HB3	1.95	0.48
1:C:16:SER:O	1:C:18:GLU:N	2.47	0.47
1:C:45:THR:HG23	1:C:68:GLN:HB3	1.97	0.47
2:B:106:VAL:HG12	2:B:137:ALA:HB2	1.97	0.46
2:D:95:ILE:O	2:D:99:LEU:HB2	2.16	0.46
1:C:56:GLN:HA	1:C:77:LEU:HA	1.98	0.46
1:C:72:VAL:O	1:C:74:LEU:N	2.45	0.45
1:C:10:LYS:HB3	1:C:11:LEU:H	1.54	0.44
1:C:144:THR:OG1	1:C:182:CYS:O	2.34	0.44
1:A:38:LEU:HD23	1:A:62:VAL:HG13	2.00	0.43
2:D:127:GLU:O	2:D:131:VAL:HG13	2.18	0.43
1:C:49:LEU:HB3	1:C:52:LEU:HD12	2.01	0.43
1:A:171:HIS:HA	1:A:172:PRO:HD3	1.92	0.43
1:C:78:ARG:HA	1:C:122:SER:O	2.18	0.42
1:A:91:ALA:HB2	1:A:129:GLY:HA3	2.02	0.42
1:A:95:LEU:HA	1:A:134:GLN:O	2.19	0.42
1:C:21:LEU:O	1:C:25:ARG:HB2	2.20	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:118:HIS:NE2	2:D:149:PRO:HD3	2.35	0.41
1:C:40:LEU:HD13	1:C:64:ILE:HG13	2.02	0.41
2:B:43:LYS:HA	2:B:48:ILE:O	2.21	0.41

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	114/198 (58%)	94 (82%)	17 (15%)	3 (3%)	5 31
1	C	153/198 (77%)	131 (86%)	18 (12%)	4 (3%)	5 31
2	B	107/172 (62%)	103 (96%)	4 (4%)	0	100 100
2	D	103/172 (60%)	94 (91%)	8 (8%)	1 (1%)	15 54
All	All	477/740 (64%)	422 (88%)	47 (10%)	8 (2%)	9 42

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	17	PRO
1	C	119	GLN
1	A	120	LEU
1	C	73	PRO
1	C	84	GLN
1	A	166	ARG
2	D	116	PRO
1	A	73	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	68/176 (39%)	60 (88%)	8 (12%)	5 23
1	C	99/176 (56%)	95 (96%)	4 (4%)	31 66
2	B	50/131 (38%)	45 (90%)	5 (10%)	7 30
2	D	48/131 (37%)	42 (88%)	6 (12%)	4 21
All	All	265/614 (43%)	242 (91%)	23 (9%)	10 37

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	45	THR
1	C	85	LEU
1	C	124	THR
1	C	182	CYS
1	A	20	HIS
1	A	40	LEU
1	A	63	LEU
1	A	83	THR
1	A	94	VAL
1	A	95	LEU
1	A	124	THR
1	A	140	CYS
2	B	19	LEU
2	B	63	VAL
2	B	76	HIS
2	B	82	THR
2	B	119	LEU
2	D	49	THR
2	D	63	VAL
2	D	82	THR
2	D	96	VAL
2	D	131	VAL
2	D	150	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are

no such sidechains identified.

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, 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	139/198 (70%)	-0.20	0	100	100	42, 56, 71, 92	0
1	C	166/198 (83%)	-0.28	0	100	100	21, 42, 53, 63	0
2	B	123/172 (71%)	-0.22	0	100	100	24, 44, 68, 76	0
2	D	119/172 (69%)	-0.23	0	100	100	36, 49, 64, 81	0
All	All	547/740 (73%)	-0.24	0	100	100	21, 49, 67, 92	0

There are no RSRZ outliers to report.

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.