Full wwPDB X-ray Structure Validation Report (i)

Oct 30, 2023 – 05:19 PM JST

PDB ID	:	4WP3
Title	:	Crystal Structure of Adenylyl cyclase from Mycobacterium avium Ma1120 wild type
Authors	:	Barathy, D.V.; Bharambe, N.G.; Suguna, K.
Deposited on	:	2014-10-17
Resolution	:	1.95 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:

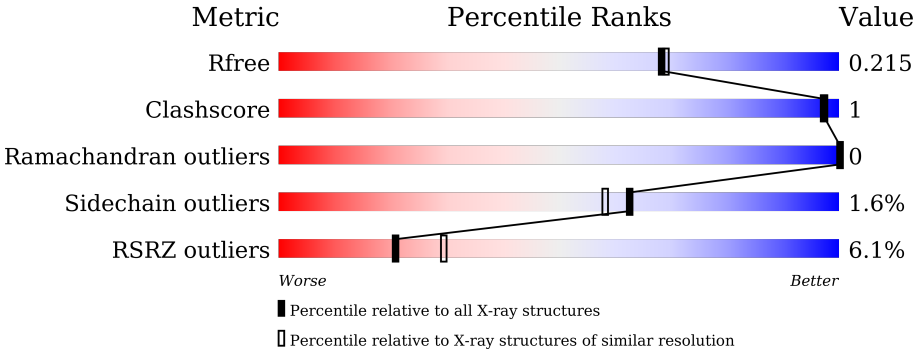
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.36
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.95 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	2580 (1.96-1.96)
Clashscore	141614	2705 (1.96-1.96)
Ramachandran outliers	138981	2678 (1.96-1.96)
Sidechain outliers	138945	2678 (1.96-1.96)
RSRZ outliers	127900	2539 (1.96-1.96)

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	210	5% 82% • 16%
1	B	210	4% 79% 5% 16%
1	C	210	6% 87% • 11%
1	D	210	5% 80% • 16%
1	E	210	8% 80% • 18%
1	F	210	3% 85% • 12%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 16027 atoms, of which 7608 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 Ma1120.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	176	2458	799	1192	228	235	4	0	2	0
1	B	177	2513	812	1218	230	249	4	0	2	0
1	C	187	2859	902	1411	266	276	4	0	8	0
1	D	176	2586	826	1269	243	244	4	0	4	0
1	E	172	2420	782	1171	223	240	4	0	2	0
1	F	184	2730	857	1347	266	256	4	0	0	0

- Molecule 2 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Cl		
2	C	1	1	1	0	0
2	F	1	1	1	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	A	51	51	51	0	0
3	B	68	68	68	0	0
3	C	127	127	127	0	0
3	D	73	73	73	0	0

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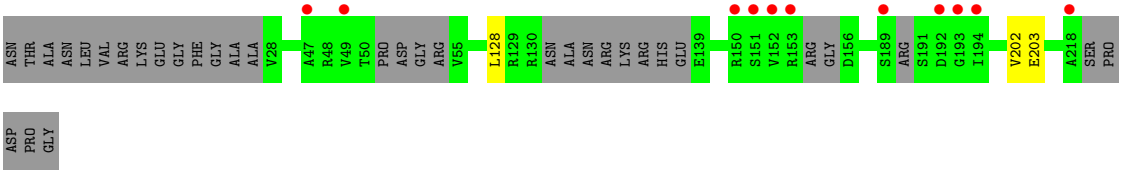
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	E	55	55	55	0	0
			Total	O		
3	F	85	85	85	0	0

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.

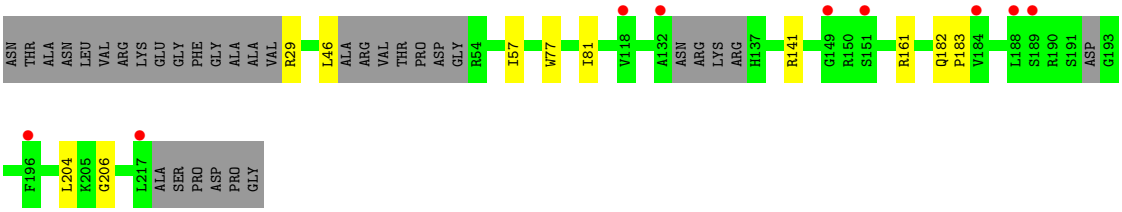
- Molecule 1: Ma1120

Chain A:



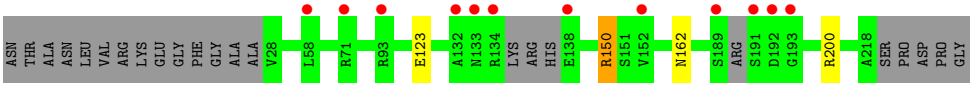
- Molecule 1: Ma1120

Chain B:



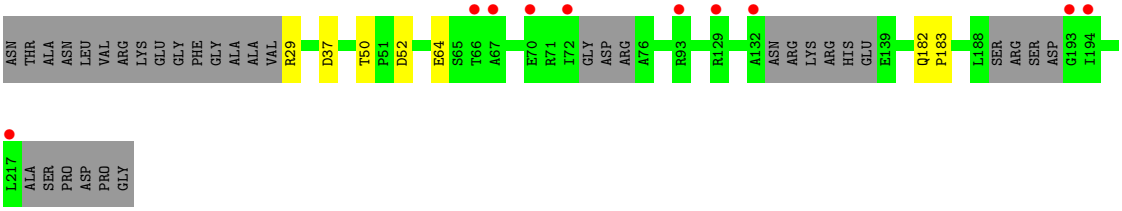
- Molecule 1: Ma1120

Chain C:



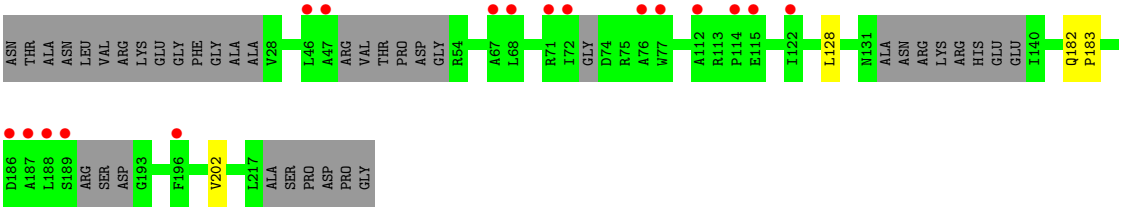
- Molecule 1: Ma1120

Chain D:



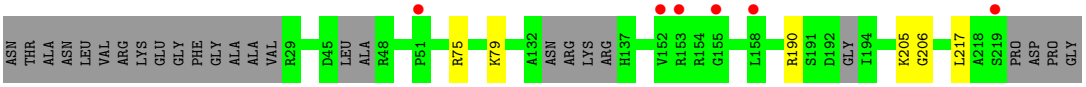
• Molecule 1: Ma1120

Chain E:



• Molecule 1: Ma1120

Chain F:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	97.79Å 53.87Å 111.20Å 90.00° 94.77° 90.00°	Depositor
Resolution (Å)	35.21 – 1.95 35.21 – 1.95	Depositor EDS
% Data completeness (in resolution range)	99.5 (35.21-1.95) 99.6 (35.21-1.95)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.81 (at 1.95Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.9_1692)	Depositor
R, R_{free}	0.178 , 0.213 0.182 , 0.215	Depositor DCC
R_{free} test set	4203 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å^2)	26.2	Xtriage
Anisotropy	0.399	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.40 , 60.7	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	0.95	EDS
Total number of atoms	16027	wwPDB-VP
Average B, all atoms (Å^2)	41.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.91% 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)

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

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	0.26	0/1285	0.43	0/1733
1	B	0.26	0/1315	0.42	0/1772
1	C	0.32	0/1505	0.49	0/2026
1	D	0.25	0/1345	0.43	0/1812
1	E	0.25	0/1270	0.44	0/1714
1	F	0.27	0/1398	0.47	0/1876
All	All	0.27	0/8118	0.45	0/10933

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 (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	1266	1192	1180	1	0
1	B	1295	1218	1212	4	0
1	C	1448	1411	1378	2	0
1	D	1317	1269	1251	3	0
1	E	1249	1171	1164	2	0
1	F	1383	1347	1347	1	0
2	C	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	F	1	0	0	0	0
3	A	51	0	0	0	0
3	B	68	0	0	0	0
3	C	127	0	0	1	0
3	D	73	0	0	0	0
3	E	55	0	0	0	0
3	F	85	0	0	0	0
All	All	8419	7608	7532	13	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 1.

All (13) 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:D:29[B]:ARG:NH2	1:D:37:ASP:OD2	2.27	0.66
1:B:161:ARG:NH2	1:B:206:GLY:O	2.42	0.50
1:D:182:GLN:HB3	1:D:183:PRO:HD3	1.98	0.46
1:F:205:LYS:HA	1:F:206:GLY:HA2	1.84	0.44
1:C:123[A]:GLU:OE2	3:C:509:HOH:O	2.21	0.43
1:B:77:TRP:CZ2	1:B:81:ILE:HD11	2.54	0.42
1:A:202:VAL:HG22	1:A:203:GLU:N	2.35	0.41
1:C:150:ARG:O	1:C:162:ASN:ND2	2.51	0.41
1:E:182:GLN:HB3	1:E:183:PRO:HD3	2.02	0.41
1:B:46:LEU:HD13	1:B:57:ILE:HD11	2.03	0.40
1:D:50:THR:OG1	1:D:52:ASP:OD1	2.27	0.40
1:B:182:GLN:HB3	1:B:183:PRO:HD3	2.03	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	168/210 (80%)	163 (97%)	5 (3%)	0	100	100
1	B	171/210 (81%)	171 (100%)	0	0	100	100
1	C	191/210 (91%)	187 (98%)	4 (2%)	0	100	100
1	D	171/210 (81%)	170 (99%)	1 (1%)	0	100	100
1	E	164/210 (78%)	164 (100%)	0	0	100	100
1	F	176/210 (84%)	174 (99%)	2 (1%)	0	100	100
All	All	1041/1260 (83%)	1029 (99%)	12 (1%)	0	100	100

There are no Ramachandran outliers to report.

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	116/168 (69%)	115 (99%)	1 (1%)	78	77
1	B	124/168 (74%)	121 (98%)	3 (2%)	49	40
1	C	147/168 (88%)	145 (99%)	2 (1%)	67	62
1	D	126/168 (75%)	125 (99%)	1 (1%)	81	80
1	E	119/168 (71%)	118 (99%)	1 (1%)	81	80
1	F	136/168 (81%)	132 (97%)	4 (3%)	42	31
All	All	768/1008 (76%)	756 (98%)	12 (2%)	62	58

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	128	LEU
1	B	29	ARG
1	B	141	ARG
1	B	204	LEU
1	C	150	ARG
1	C	200	ARG
1	D	64	GLU

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Mol	Chain	Res	Type
1	E	128	LEU
1	F	75	ARG
1	F	79	LYS
1	F	190	ARG
1	F	217	LEU

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)

Of 2 ligands modelled in this entry, 2 are 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	176/210 (83%)	0.21	11 (6%)	20	28	23, 39, 82, 109	0
1	B	177/210 (84%)	0.25	9 (5%)	28	37	23, 42, 79, 89	0
1	C	187/210 (89%)	0.27	12 (6%)	19	28	13, 23, 62, 94	0
1	D	176/210 (83%)	0.17	10 (5%)	23	32	22, 37, 72, 92	0
1	E	172/210 (81%)	0.31	17 (9%)	7	12	22, 48, 78, 94	0
1	F	184/210 (87%)	0.09	6 (3%)	46	56	19, 36, 76, 110	0
All	All	1072/1260 (85%)	0.21	65 (6%)	21	29	13, 37, 77, 110	0

All (65) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	72	ILE	5.7
1	A	151	SER	5.2
1	E	187	ALA	5.1
1	E	189	SER	5.0
1	F	152	VAL	4.8
1	A	47	ALA	4.8
1	B	189	SER	4.6
1	D	132	ALA	4.4
1	D	194	ILE	4.3
1	F	153	ARG	4.2
1	B	196	PHE	3.9
1	E	46	LEU	3.9
1	B	217	LEU	3.7
1	D	66	THR	3.5
1	B	151	SER	3.5
1	C	189	SER	3.5
1	E	71	ARG	3.5
1	E	112	ALA	3.3
1	E	72	ILE	3.3

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Mol	Chain	Res	Type	RSRZ
1	D	129	ARG	3.2
1	E	77	TRP	3.1
1	E	76	ALA	3.1
1	C	134	ARG	3.1
1	E	188	LEU	3.1
1	E	115	GLU	3.0
1	C	132	ALA	3.0
1	D	67	ALA	2.9
1	A	189	SER	2.9
1	C	192	ASP	2.8
1	B	188	LEU	2.8
1	D	193	GLY	2.8
1	D	70	GLU	2.8
1	E	68	LEU	2.8
1	A	218	ALA	2.8
1	C	191	SER	2.6
1	A	193	GLY	2.6
1	F	51	PRO	2.6
1	E	67	ALA	2.6
1	E	47	ALA	2.5
1	A	49	VAL	2.5
1	C	133	ASN	2.5
1	C	193	GLY	2.4
1	F	219	SER	2.4
1	C	138	GLU	2.4
1	B	184	VAL	2.4
1	E	122	ILE	2.4
1	A	192	ASP	2.4
1	B	132	ALA	2.3
1	A	153	ARG	2.3
1	A	152	VAL	2.3
1	A	194	ILE	2.3
1	E	186	ASP	2.3
1	F	155	GLY	2.2
1	C	93	ARG	2.2
1	B	118	VAL	2.2
1	C	152	VAL	2.2
1	E	114	PRO	2.2
1	B	149	GLY	2.2
1	D	217	LEU	2.1
1	F	158	LEU	2.1
1	C	71	ARG	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	150	ARG	2.0
1	E	196	PHE	2.0
1	D	93	ARG	2.0
1	C	58	LEU	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 monosaccharides 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	CL	F	301	1/1	0.93	0.06	47,47,47,47	0
2	CL	C	301	1/1	0.97	0.06	42,42,42,42	0

6.5 Other polymers (i)

There are no such residues in this entry.