



Full wwPDB X-ray Structure Validation Report

Feb 28, 2014 – 04:09 AM GMT

PDB ID : 1DEV
Title : CRYSTAL STRUCTURE OF SMAD2 MH2 DOMAIN BOUND TO THE
SMAD-BINDING DOMAIN OF SARA
Authors : Shi, Y.; Wu, G.
Deposited on : 1999-11-15
Resolution : 2.20 Å(reported)

This is a full wwPDB validation report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

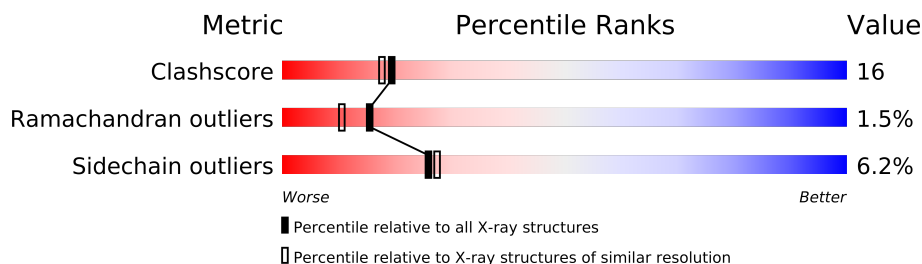
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 21963
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable22683

1 Overall quality at a glance

The reported resolution of this entry is 2.20 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))
Clashscore	79885	3751 (2.20-2.20)
Ramachandran outliers	78287	3681 (2.20-2.20)
Sidechain outliers	78261	3682 (2.20-2.20)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	196	
1	C	196	
2	B	41	
2	D	41	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 3643 atoms, of which 0 are hydrogen and 0 are deuterium.

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 MAD (mothers against decapentaplegic, Drosophila) homolog 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	194	Total	C	N	O	S	0	0	0
			1549	983	271	283	12			
1	C	192	Total	C	N	O	S	0	0	0
			1528	970	266	280	12			

- Molecule 2 is a protein called Smad anchor for receptor activation.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	41	Total	C	N	O	S	0	0	0
			289	179	48	60	2			
2	D	39	Total	C	N	O	S	0	0	0
			277	172	46	57	2			

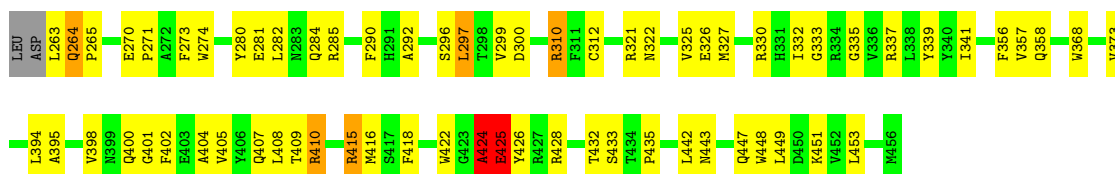
3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

Note EDS was not executed.

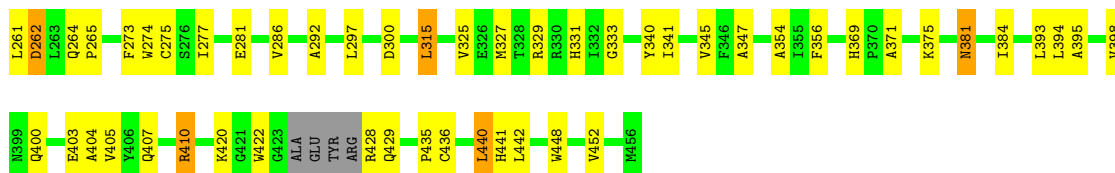
- Molecule 1: MAD (mothers against decapentaplegic, Drosophila) homolog 2

Chain A: 



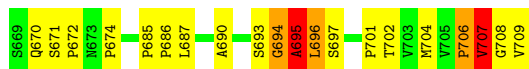
- Molecule 1: MAD (mothers against decapentaplegic, Drosophila) homolog 2

Chain C: 



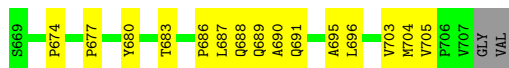
- Molecule 2: Smad anchor for receptor activation

Chain B: 



- Molecule 2: Smad anchor for receptor activation

Chain D: 



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section will therefore be incomplete.

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	138.50Å 138.50Å 55.90Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	20.00 – 2.20	Depositor
% Data completeness (in resolution range)	99.1 (20.00-2.20)	Depositor
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR 3.851	Depositor
R, R_{free}	0.218 , 0.276	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3643	wwPDB-VP
Average B, all atoms (Å ²)	37.0	wwPDB-VP

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	0.58	1/1590 (0.1%)	0.67	2/2162 (0.1%)
1	C	0.38	0/1567	0.61	0/2130
2	B	1.53	1/298 (0.3%)	1.14	3/413 (0.7%)
2	D	0.33	0/286	0.64	0/398
All	All	0.63	2/3741 (0.1%)	0.69	5/5103 (0.1%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	696	LEU	N-CA	25.58	1.97	1.46
1	A	425	GLU	N-CA	17.91	1.82	1.46

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	695	ALA	C-N-CA	-14.82	84.65	121.70
1	A	424	ALA	C-N-CA	-11.74	92.36	121.70
2	B	696	LEU	N-CA-CB	-7.67	95.06	110.40
2	B	696	LEU	N-CA-C	6.41	128.29	111.00
1	A	425	GLU	N-CA-CB	-5.23	101.19	110.60

There are no chirality outliers.

There are no planarity outliers.

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1549	0	1499	56	0
1	C	1528	0	1480	41	0
2	B	289	0	280	23	0
2	D	277	0	268	11	0
All	All	3643	0	3527	117	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 16.

All (117) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:425:GLU:CA	1:A:425:GLU:N	1.82	1.43
2:B:696:LEU:N	2:B:696:LEU:CA	1.97	1.27
2:B:695:ALA:O	2:B:696:LEU:CA	1.93	1.15
2:B:695:ALA:O	2:B:696:LEU:HA	1.50	1.09
2:B:695:ALA:C	2:B:696:LEU:CA	2.26	1.02
1:A:424:ALA:C	1:A:425:GLU:CA	2.29	1.00
1:A:424:ALA:O	1:A:425:GLU:CA	2.21	0.88
1:A:424:ALA:O	1:A:425:GLU:HA	1.77	0.84
2:B:694:GLY:O	2:B:696:LEU:N	2.12	0.83
1:C:452:VAL:HB	2:D:705:VAL:HG11	1.62	0.80
1:A:265:PRO:HB3	2:B:704:MET:SD	2.22	0.79
1:A:264:GLN:HB2	1:A:265:PRO:HD2	1.64	0.78
1:A:321:ARG:HD2	1:A:326:GLU:HG2	1.65	0.77
2:B:708:GLY:O	2:B:709:VAL:HG22	1.85	0.76
1:C:420:LYS:HD2	1:C:428:ARG:HG3	1.70	0.74
1:C:381:ASN:HD21	2:D:689:GLN:HE22	1.36	0.72
1:C:369:HIS:HD2	1:C:371:ALA:H	1.41	0.69
1:C:281:GLU:HA	1:C:435:PRO:O	1.95	0.66
2:D:688:GLN:O	2:D:691:GLN:HG2	1.96	0.65
1:A:425:GLU:N	1:A:425:GLU:CB	2.60	0.64
2:B:696:LEU:N	2:B:696:LEU:CB	2.60	0.64
1:A:425:GLU:CG	1:A:425:GLU:N	2.62	0.63
1:A:357:VAL:HG22	1:A:416:MET:HG2	1.81	0.63
1:C:381:ASN:ND2	2:D:689:GLN:HE22	1.95	0.62
1:C:422:TRP:HA	1:C:429:GLN:HB3	1.82	0.60
2:B:671:SER:HB3	2:B:672:PRO:HD2	1.82	0.60
1:A:281:GLU:HA	1:A:435:PRO:O	2.00	0.60
1:A:300:ASP:HB2	1:A:333:GLY:O	2.02	0.59
1:C:292:ALA:HB2	1:C:297:LEU:HD22	1.85	0.58
1:A:310:ARG:HD2	1:A:312:CYS:SG	2.41	0.58
1:C:448:TRP:O	1:C:452:VAL:HG13	2.04	0.57
1:A:407:GLN:O	1:A:410:ARG:HG2	2.05	0.57

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:C:265:PRO:HG3	2:D:704:MET:SD	2.45	0.57
1:A:292:ALA:HB2	1:A:297:LEU:HD22	1.87	0.57
1:C:329:ARG:HG3	1:C:436:CYS:SG	2.45	0.57
2:B:696:LEU:N	2:B:696:LEU:HD13	2.21	0.56
1:C:394:LEU:O	1:C:398:VAL:HG13	2.07	0.55
1:C:369:HIS:CD2	1:C:371:ALA:H	2.23	0.55
1:A:296:SER:HB3	1:A:337:ARG:NH1	2.21	0.55
1:A:402:PHE:HB2	2:B:709:VAL:HG21	1.89	0.54
1:A:358:GLN:HE21	1:A:415:ARG:HH21	1.53	0.54
1:A:428:ARG:HB3	1:A:433:SER:HB2	1.90	0.53
1:A:448:TRP:CH2	2:B:701:PRO:HB2	2.43	0.53
1:C:400:GLN:HB3	1:C:404:ALA:CB	2.37	0.53
1:C:429:GLN:HE21	1:C:429:GLN:HA	1.74	0.53
1:A:449:LEU:O	1:A:453:LEU:HD13	2.09	0.53
1:C:347:ALA:HB2	1:C:384:ILE:HD13	1.91	0.53
2:B:694:GLY:O	2:B:695:ALA:C	2.47	0.52
2:B:696:LEU:N	2:B:696:LEU:CD1	2.73	0.51
1:A:358:GLN:HB2	1:A:422:TRP:CZ2	2.45	0.51
2:D:690:ALA:HB1	2:D:696:LEU:HD21	1.92	0.50
1:C:407:GLN:O	1:C:410:ARG:HG2	2.13	0.49
1:A:368:TRP:CE2	2:B:674:PRO:HG3	2.48	0.49
1:C:300:ASP:HB2	1:C:333:GLY:O	2.12	0.48
1:A:263:LEU:HB3	1:A:264:GLN:OE1	2.14	0.48
1:C:395:ALA:O	1:C:398:VAL:HG22	2.14	0.47
1:C:440:LEU:HD23	1:C:440:LEU:H	1.79	0.47
1:A:356:PHE:HE2	1:A:426:TYR:HH	1.63	0.47
1:C:403:GLU:O	1:C:407:GLN:HG2	2.15	0.47
1:A:358:GLN:HE21	1:A:415:ARG:NH2	2.12	0.47
1:C:341:ILE:HG21	2:D:690:ALA:CB	2.45	0.47
1:A:395:ALA:O	1:A:398:VAL:HG22	2.14	0.47
1:A:281:GLU:OE2	1:A:321:ARG:HG3	2.15	0.46
1:C:420:LYS:CD	1:C:428:ARG:HG3	2.42	0.46
1:A:407:GLN:HE22	1:A:410:ARG:NH1	2.14	0.46
1:A:325:VAL:HA	1:A:435:PRO:HB3	1.96	0.46
1:A:263:LEU:N	2:B:706:PRO:O	2.49	0.46
1:C:356:PHE:CE2	1:C:420:LYS:HE3	2.50	0.46
2:B:695:ALA:O	2:B:696:LEU:C	2.54	0.46
1:A:447:GLN:O	1:A:451:LYS:HG2	2.16	0.46
1:C:429:GLN:NE2	1:C:429:GLN:HA	2.30	0.45
1:A:322:ASN:O	1:A:326:GLU:HG3	2.16	0.45
1:C:274:TRP:CD2	1:C:340:TYR:HB2	2.52	0.45
2:B:706:PRO:O	2:B:707:VAL:HG13	2.17	0.44

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:C:354:ALA:CB	1:C:375:LYS:HE3	2.47	0.44
2:D:690:ALA:HB1	2:D:696:LEU:CD2	2.47	0.44
1:A:425:GLU:CD	1:A:425:GLU:N	2.71	0.44
1:A:401:GLY:O	1:A:405:VAL:HG23	2.17	0.44
1:A:264:GLN:HB2	1:A:265:PRO:CD	2.41	0.43
1:C:325:VAL:HA	1:C:435:PRO:HB3	1.99	0.43
1:A:409:THR:HB	1:A:410:ARG:HE	1.83	0.43
1:C:327:MET:O	1:C:331:HIS:HD2	2.01	0.43
1:C:345:VAL:HG21	1:C:442:LEU:HD22	2.00	0.43
1:A:326:GLU:O	1:A:330:ARG:HG3	2.17	0.43
1:A:290:PHE:CE1	1:A:297:LEU:HD13	2.54	0.43
1:C:275:CYS:HA	1:C:441:HIS:O	2.19	0.43
1:C:420:LYS:HB2	1:C:420:LYS:NZ	2.34	0.43
1:C:428:ARG:HH22	2:D:674:PRO:HB2	1.84	0.43
2:D:677:PRO:HA	2:D:680:TYR:CZ	2.54	0.42
1:A:271:PRO:CG	1:A:274:TRP:HA	2.49	0.42
1:C:274:TRP:CE2	1:C:340:TYR:HB2	2.55	0.42
1:A:394:LEU:HA	1:A:408:LEU:HD11	2.02	0.42
1:A:425:GLU:N	1:A:426:TYR:N	2.68	0.41
1:A:282:LEU:HD11	1:A:322:ASN:HD21	1.85	0.41
1:A:273:PHE:HA	1:A:292:ALA:O	2.20	0.41
1:A:299:VAL:O	1:A:335:GLY:HA3	2.20	0.41
1:A:280:TYR:CE2	1:A:285:ARG:HD3	2.55	0.41
1:C:315:LEU:HD12	1:C:315:LEU:HA	1.88	0.41
1:A:425:GLU:N	1:A:425:GLU:C	2.67	0.41
1:A:332:ILE:HG23	1:A:418:PHE:CD1	2.55	0.41
1:C:405:VAL:HG11	1:C:452:VAL:CG2	2.50	0.41
2:D:703:VAL:O	2:D:704:MET:HB2	2.20	0.41
1:C:261:LEU:O	1:C:262:ASP:C	2.58	0.41
1:A:425:GLU:CD	1:A:425:GLU:H	2.23	0.41
1:A:265:PRO:HB2	2:B:702:THR:CG2	2.51	0.41
1:A:296:SER:HB3	1:A:337:ARG:HH12	1.85	0.41
1:A:341:ILE:O	2:B:695:ALA:HB1	2.21	0.41
1:C:273:PHE:HA	1:C:292:ALA:O	2.20	0.41
1:A:339:TYR:CE1	2:B:686:PRO:HG2	2.56	0.41
2:B:685:PRO:HA	2:B:686:PRO:HD3	1.96	0.41
1:A:400:GLN:HB3	1:A:404:ALA:HB3	2.03	0.41
1:C:264:GLN:HA	1:C:265:PRO:HD3	1.87	0.40
2:B:690:ALA:O	2:B:693:SER:HB3	2.21	0.40
1:A:358:GLN:HB3	1:A:415:ARG:HB2	2.04	0.40
1:C:275:CYS:SG	1:C:277:ILE:HD11	2.62	0.40
1:A:443:ASN:O	1:A:447:GLN:HG3	2.22	0.40

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:C:277:ILE:HD12	1:C:277:ILE:N	2.37	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone ⓘ

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	192/196 (98%)	186 (97%)	5 (3%)	1 (0%)	38	38
1	C	188/196 (96%)	185 (98%)	2 (1%)	1 (0%)	38	38
2	B	39/41 (95%)	32 (82%)	3 (8%)	4 (10%)	1	0
2	D	37/41 (90%)	32 (86%)	4 (11%)	1 (3%)	8	3
All	All	456/474 (96%)	435 (95%)	14 (3%)	7 (2%)	15	10

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	695	ALA
2	B	707	VAL
1	A	424	ALA
2	B	706	PRO
1	C	262	ASP
2	D	695	ALA
2	B	694	GLY

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	169/171 (99%)	157 (93%)	12 (7%)	21	21
1	C	168/171 (98%)	162 (96%)	6 (4%)	47	56
2	B	35/35 (100%)	31 (89%)	4 (11%)	8	7
2	D	34/35 (97%)	31 (91%)	3 (9%)	14	13
All	All	406/412 (98%)	381 (94%)	25 (6%)	26	27

All (25) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	264	GLN
1	A	270	GLU
1	A	284	GLN
1	A	297	LEU
1	A	310	ARG
1	A	327	MET
1	A	373	VAL
1	A	410	ARG
1	A	415	ARG
1	A	425	GLU
1	A	432	THR
1	A	442	LEU
2	B	670	GLN
2	B	687	LEU
2	B	697	SER
2	B	707	VAL
1	C	286	VAL
1	C	315	LEU
1	C	381	ASN
1	C	393	LEU
1	C	410	ARG
1	C	440	LEU
2	D	683	THR
2	D	686	PRO
2	D	687	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	284	GLN
1	A	318	ASN

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Mol	Chain	Res	Type
1	A	358	GLN
1	A	399	ASN
1	A	407	GLN
1	A	455	GLN
1	C	331	HIS
1	C	369	HIS
1	C	381	ASN
1	C	387	ASN
1	C	429	GLN

5.3.3 RNA ⓘ

There are no RNA chains 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 carbohydrates in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

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 ⓘ

EDS was not executed - this section will therefore be empty.

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

EDS was not executed - this section will therefore be empty.

6.3 Carbohydrates ⓘ

EDS was not executed - this section will therefore be empty.

6.4 Ligands ⓘ

EDS was not executed - this section will therefore be empty.

6.5 Other polymers ⓘ

EDS was not executed - this section will therefore be empty.