

Joel Goergen – Force10 Networks

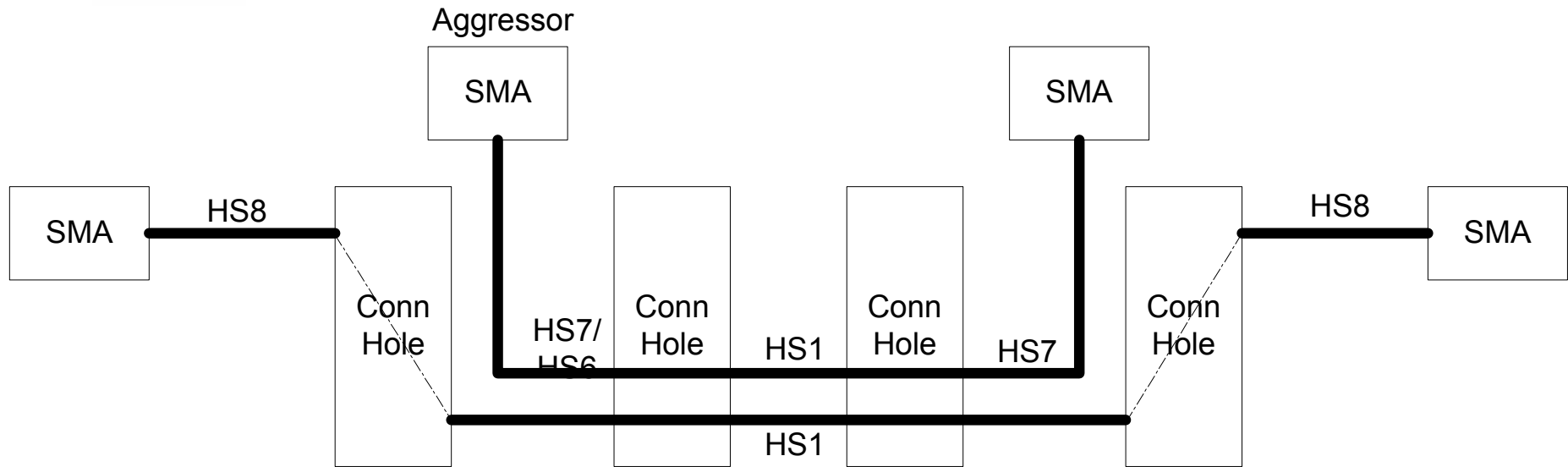
joel@force10networks.com

Subject : IEEE 802.3ap Backplane Ethernet

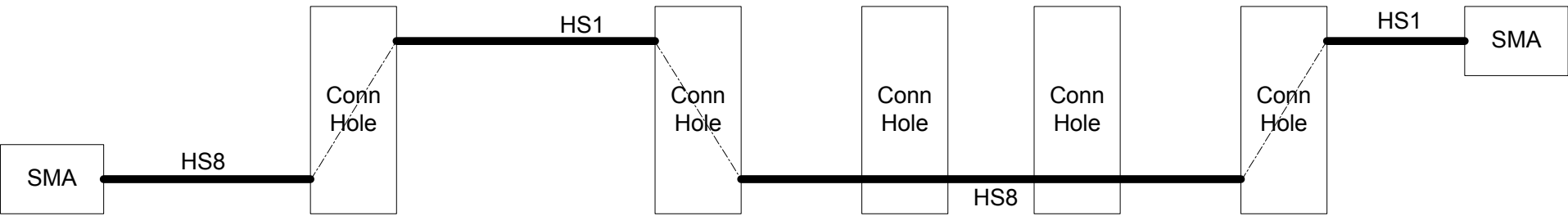
Abstract : This presentation documents a connector-less test card that will validate the informative channel mask discussed in the 802.3ap channel ad-hoc meetings.

- Test Card Block Diagram.
- Review Stack Details.
- Review Gerber Layers.
- Summary of Fabrication.
- Review SDD21, SDD11, SDD22.
- Review NEXT/FEXT.

Test Card Outline – 2 connectors



Test Card Outline – 3 connectors



Channel Lengths

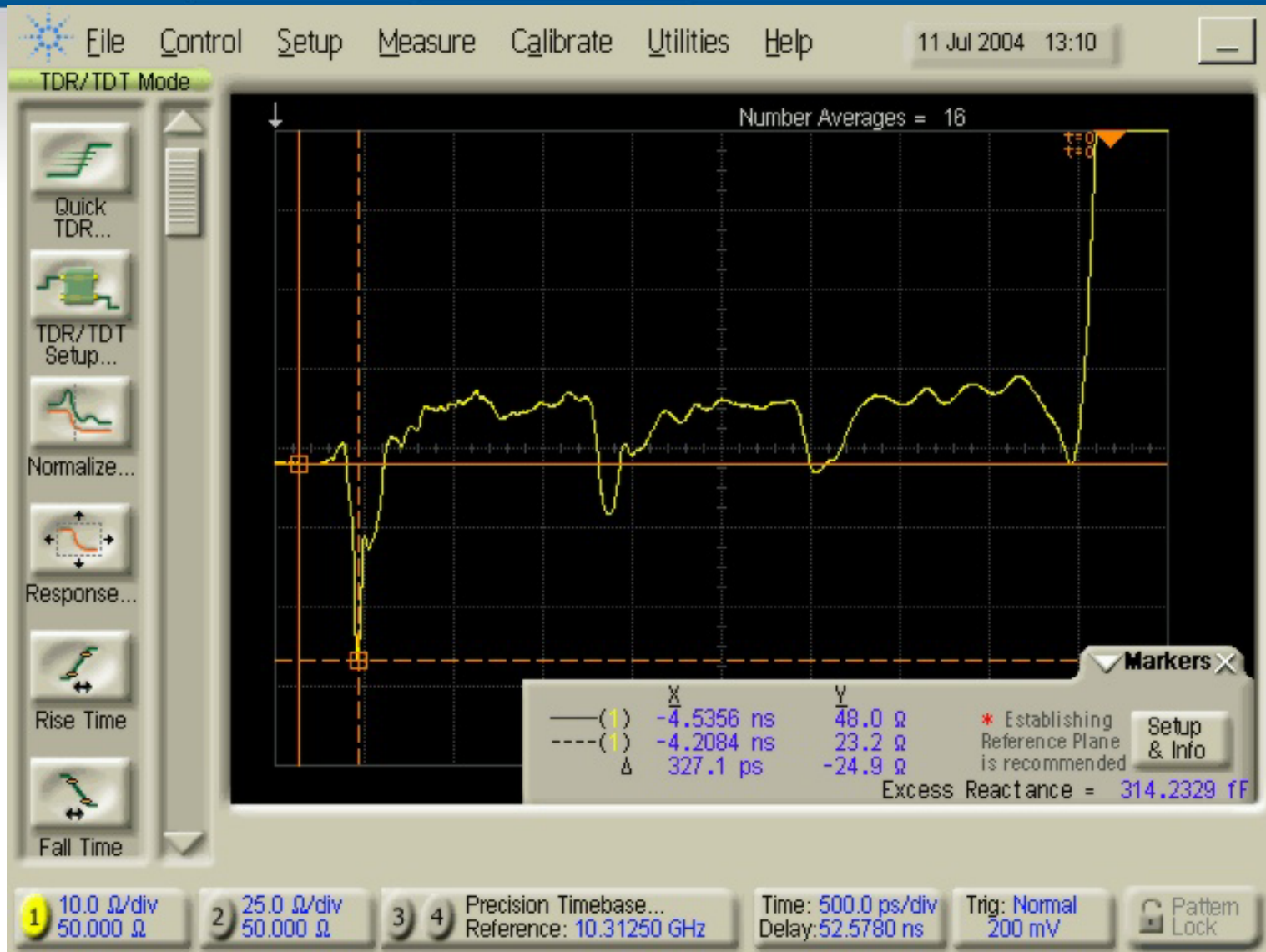
#		LYR							
Conn		HS1		HS1		HS8		HS1	Total
2	CH1	4		3		4			11
2	CH2	7		3		7			17
2	CH3	10		3		10			23
3	CH4	3		3		3		7	16
3	CH5	5		5		3		10	23
2	CH6	4		10		4			18
2	CH7	7		10		7			24
2	CH8	10		10		10			30
3	CH9	3		3		10		7	23
3	CH10	5		5		10		10	30
2	CH11	4		15		4			23
2	CH12	7		15		7			29
2	CH13	10		15		10			35
3	CH14	3		3		15		7	28
3	CH15	5		5		15		10	35
2	CH16	4		20		4			28
2	CH17	7		20		7			34
2	CH18	10		20		10			40
3	CH19	3		3		20		7	33
3	CH20	5		5		20		10	40

Channel Lengths - Aggressors

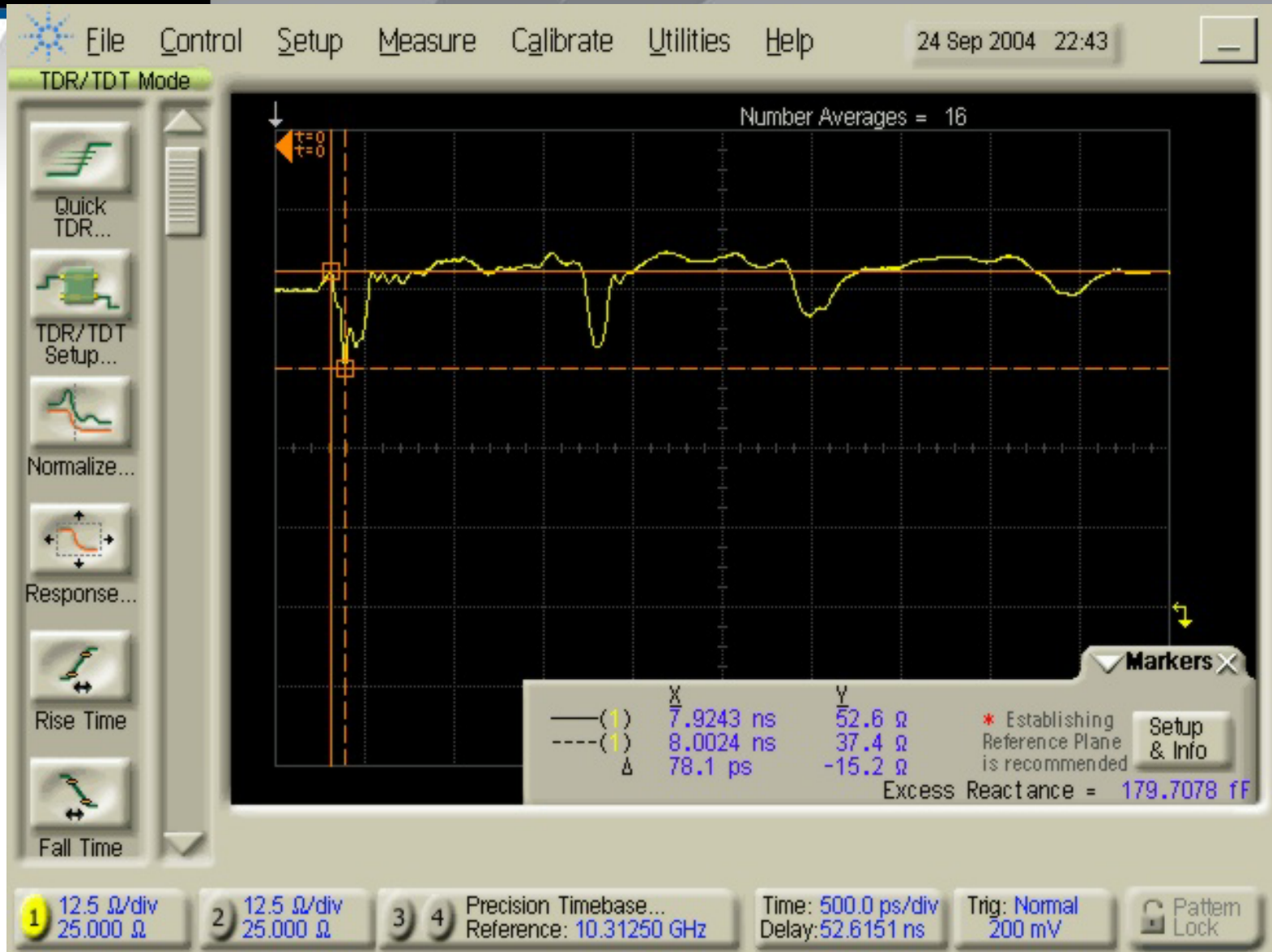
#		LYR							
Conn		HS6				HS6		Total	
2	CH2-0	~2		HS1		~2		8	
2	CH2-1	~5		HS5		~5		16	
2	CH2-2	~5		HS5		~5		14	
2	CH2-3	~5		HS1		~5		16	
2	CH7-0	~2		HS1		~2		15	
2	CH7-1	~2		HS5		~5		18	
2	CH7-2	~2		HS5		~5		18	
2	CH7-3	~2		HS1		~5		21	
2	CH12-0	~3		HS1		~3		19	
2	CH12-1	~3		HS5		~3		18	
2	CH12-2	~3		HS5		~3		19	
2	CH12-3	~3		HS1		~3		21	
2	CH17-0	~3		HS1		~3		24	
2	CH17-1	~3		HS5		~3		18	
2	CH17-2	~3		HS5		~3		19	
2	CH17-3	~3		HS1		~3		26	

- The original design called for 13.5mil drill VIA, but the aspect ratio forced this to a 16mil drill VIA.
- SMA SMT pad was designed with ground removed under the pad to reduce impedance mismatch.

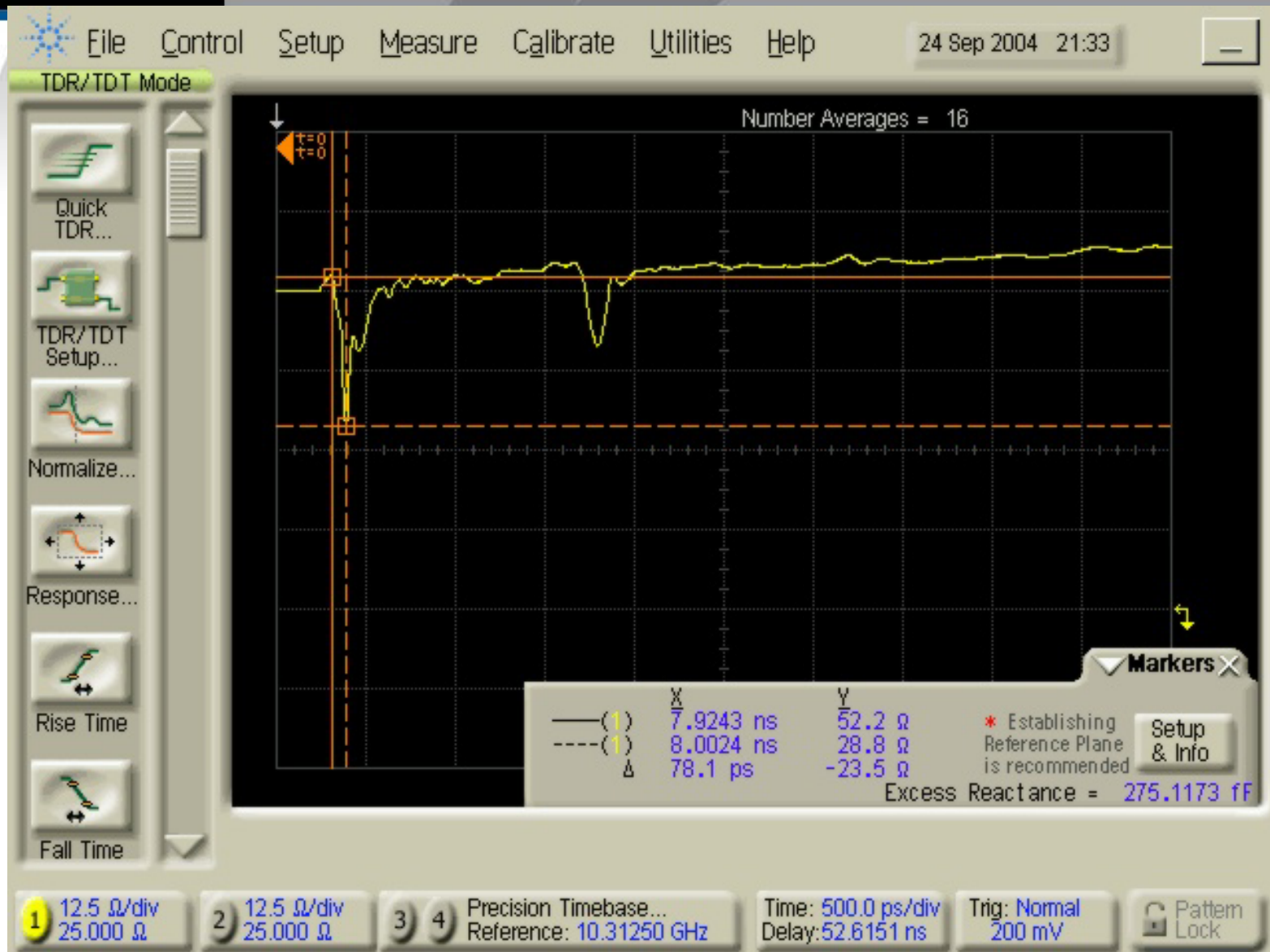
-13 FAB Data: Channel Data OLD CH1 TDR



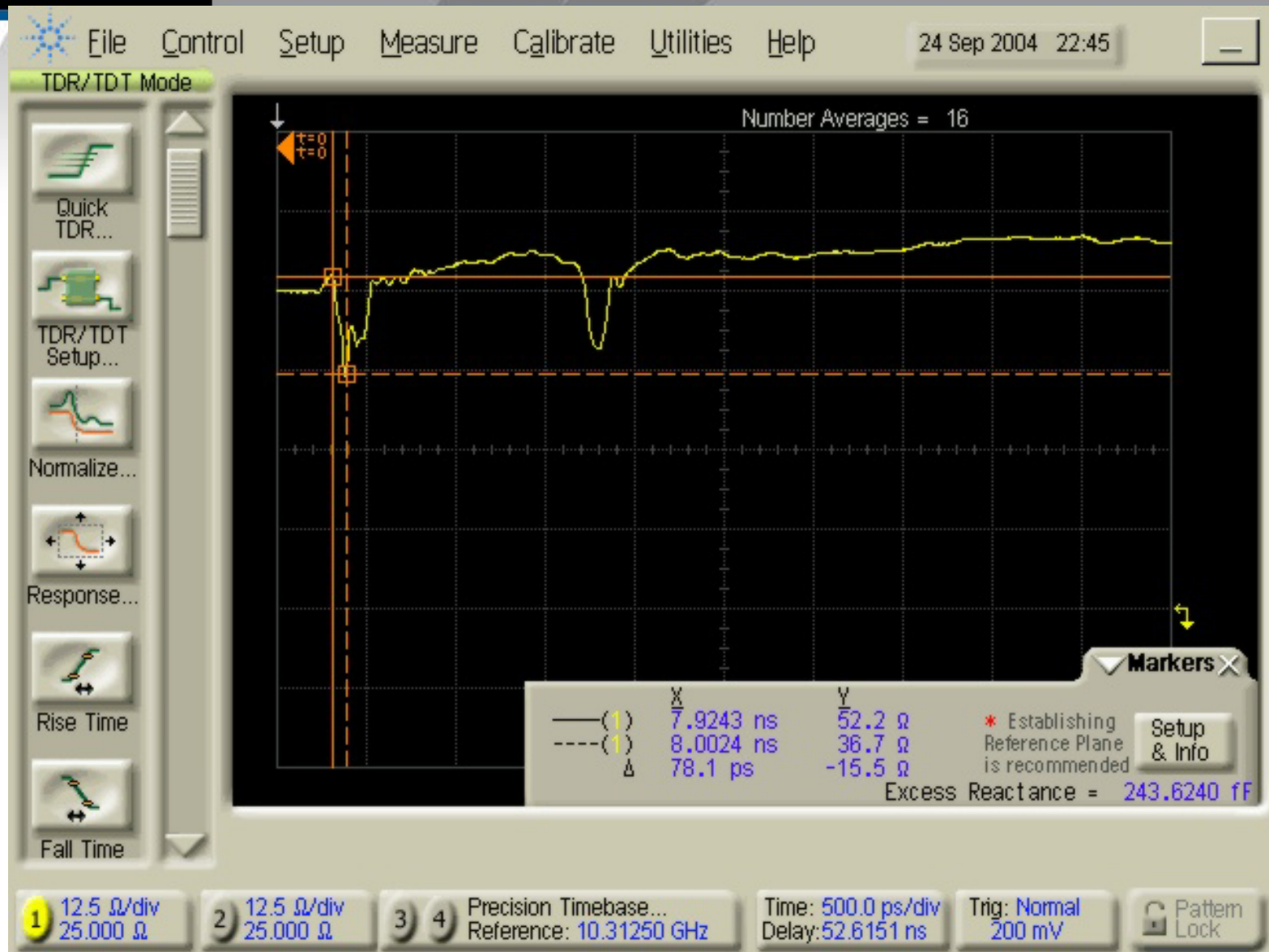
-13 FAB Data: Channel Data NEW CH1 TDR



-13 FAB Data: Channel Data OLD CH16 TDR



-13 FAB Data: Channel Data NEW CH16 TDR



-13 FAB Data

Company: Force10 Networks

Contact: Joel Goergen

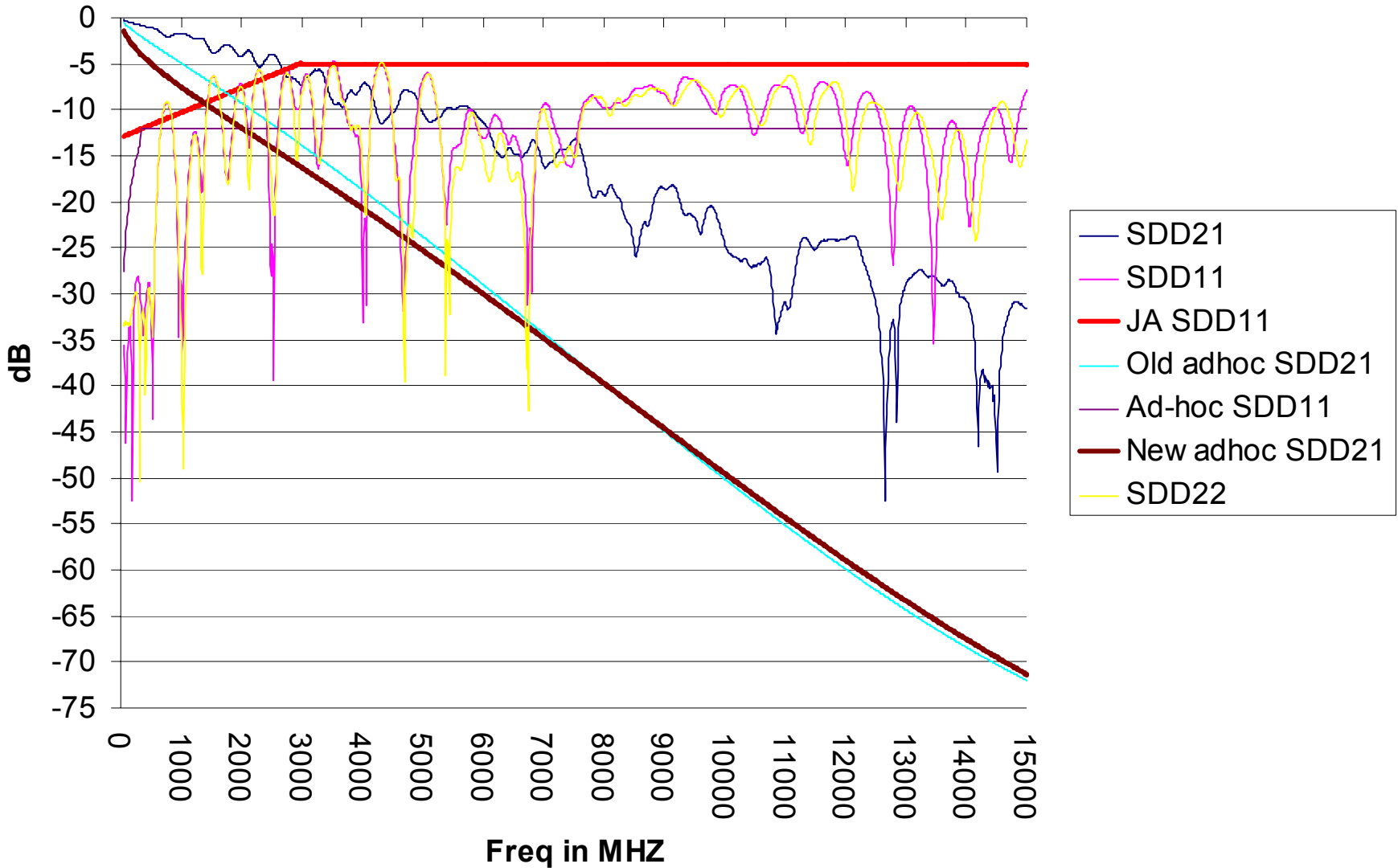
Board Name: Test Back Plane - Scorpion King

Detail by: Joel Goergen

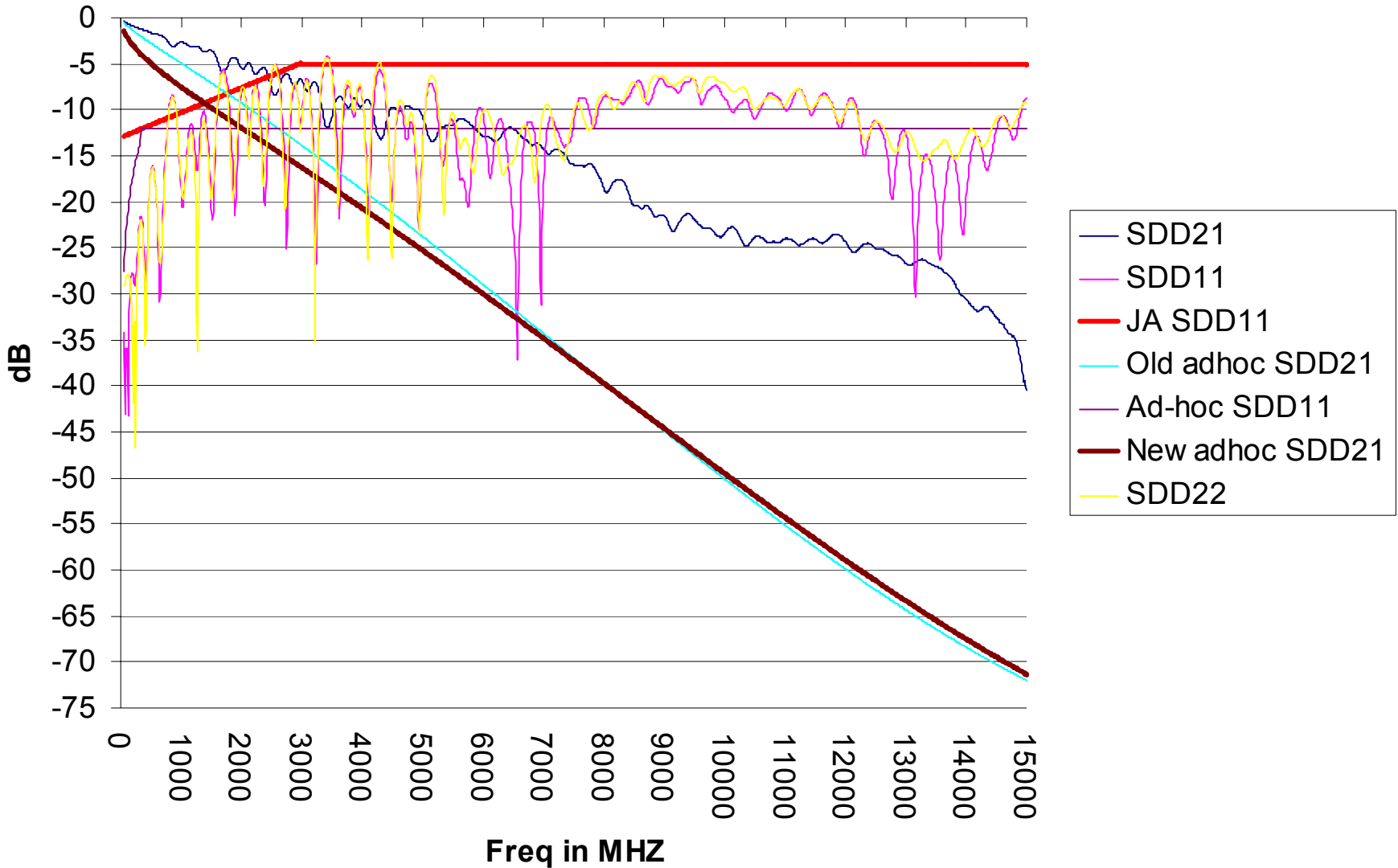
Grain Direction: in the 24inch

Layers	Specified Thickness	Cross Section Diagram	Layer Name Definition	Real Data	Hole Wall	Impedance	Geometry	Impedance	Geometry
	0.7	(((		Mask					
L01	2.0	(((	Foil & Plating	2.0					
	1.3	(((	Pads Only	1.2					
	6.0	|||||		6.0	1.44				
L02	1.3	(((	GND	1.2					
	5.5	|||||		5.2					
L03	1.3	(((	HS1	1.2		102 +/- 1.5ohms 6on14		53.4 +/- 2ohms 6on14	
	9.1	|||||		9.6					
L04	1.3	(((	GND	1.2					
	5.5	|||||		5.3					
L05	1.3	(((	HS2	1.2					
	9.1	|||||		8.8					
L06	1.3	(((	GND	1.2					
	5.5	|||||		5.3					
L07	1.3	(((	HS3	1.2					
	9.1	|||||		9.9					
L08	1.3	(((	GND	1.2					
	5.5	|||||		5.4					
L09	1.3	(((	HS4	1.2					
	9.1	|||||		9.0					
L10	1.3	(((	GND	1.2					
	5.5	|||||		5.4					
L11	1.3	(((	Plane	1.2					
	10.1	|||||		10.1					
L12	1.3	(((	Plane	1.2					
	5.5	|||||		5.4	1.37				
L13	1.3	(((	Plane	1.2					
	10.1	|||||		9.7					
L14	1.3	(((	Plane	1.2					
	5.5	|||||		5.3					
L15	1.3	(((	GND	1.2					
	9.1	|||||		8.8					
L16	1.3	(((	HS5	1.2					
	5.5	|||||		5.1					
L17	1.3	(((	GND	1.2					
	9.1	|||||		9.1					
L18	1.3	(((	HS6	1.2					
	5.5	|||||		5.2					
L19	1.3	(((	GND	1.2					
	9.1	|||||		8.7					
L20	1.3	(((	HS7	1.2		102 +/- 1.5ohms 6on14		53.4 +/- 2ohms 6on14	
	5.5	|||||		5.4					
L21	1.3	(((	GND	1.2					
	9.1	|||||		8.9					
L22	1.3	(((	HS8	1.2		102 +/- 1.5ohms 6on14		53.4 +/- 2ohms 6on14	
	5.5	|||||		5.3					
L23	1.3	(((	GND	1.2					
	6.0	|||||		6.0	1.44				
	1.3	(((Pads Only	1.2					
L24	2.0	(((Foil & Plating	2.0					
	0.7	(((((Mask					

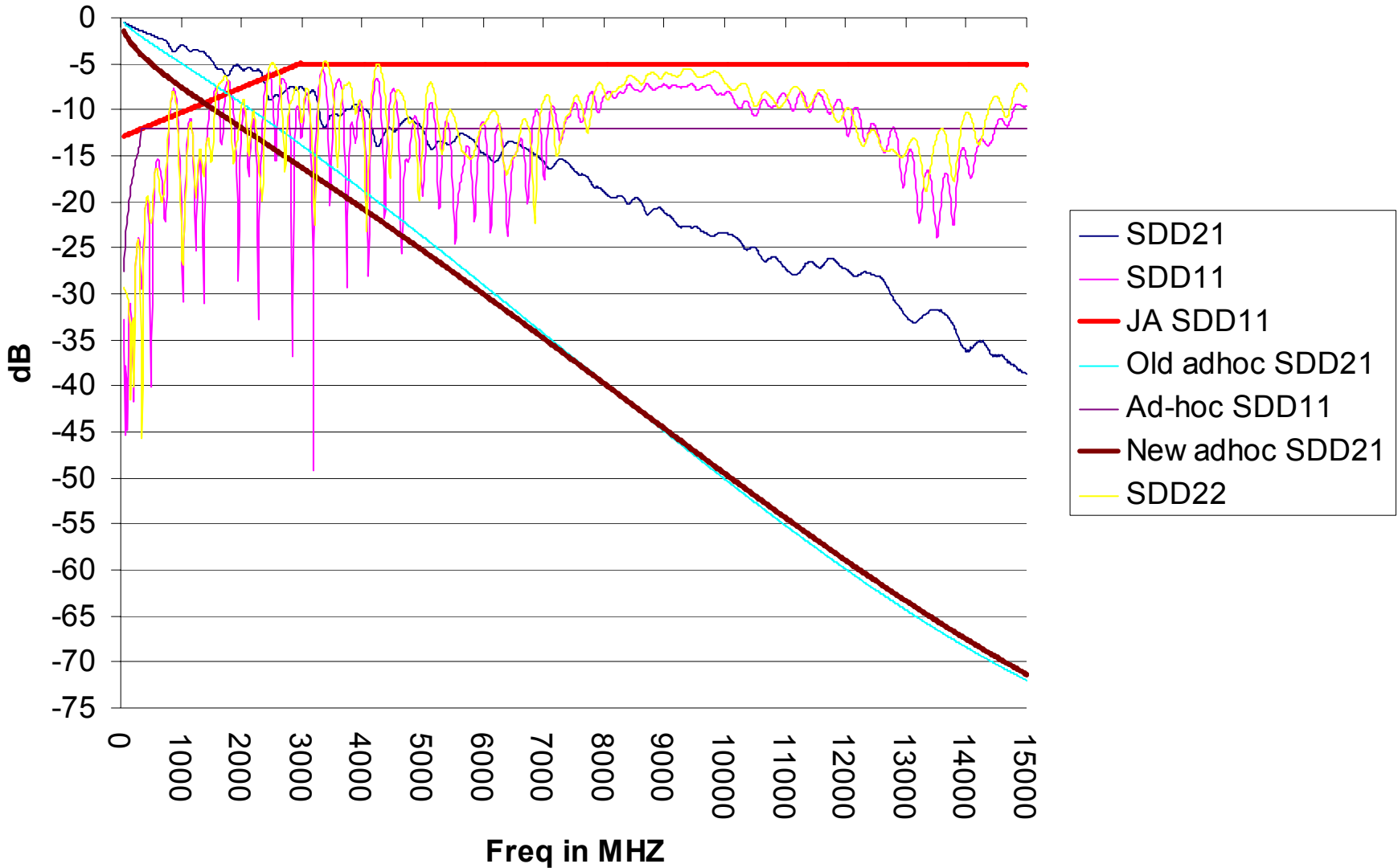
SDD21 SDD11 SDD22 CH1_4_3_4in N4000-13



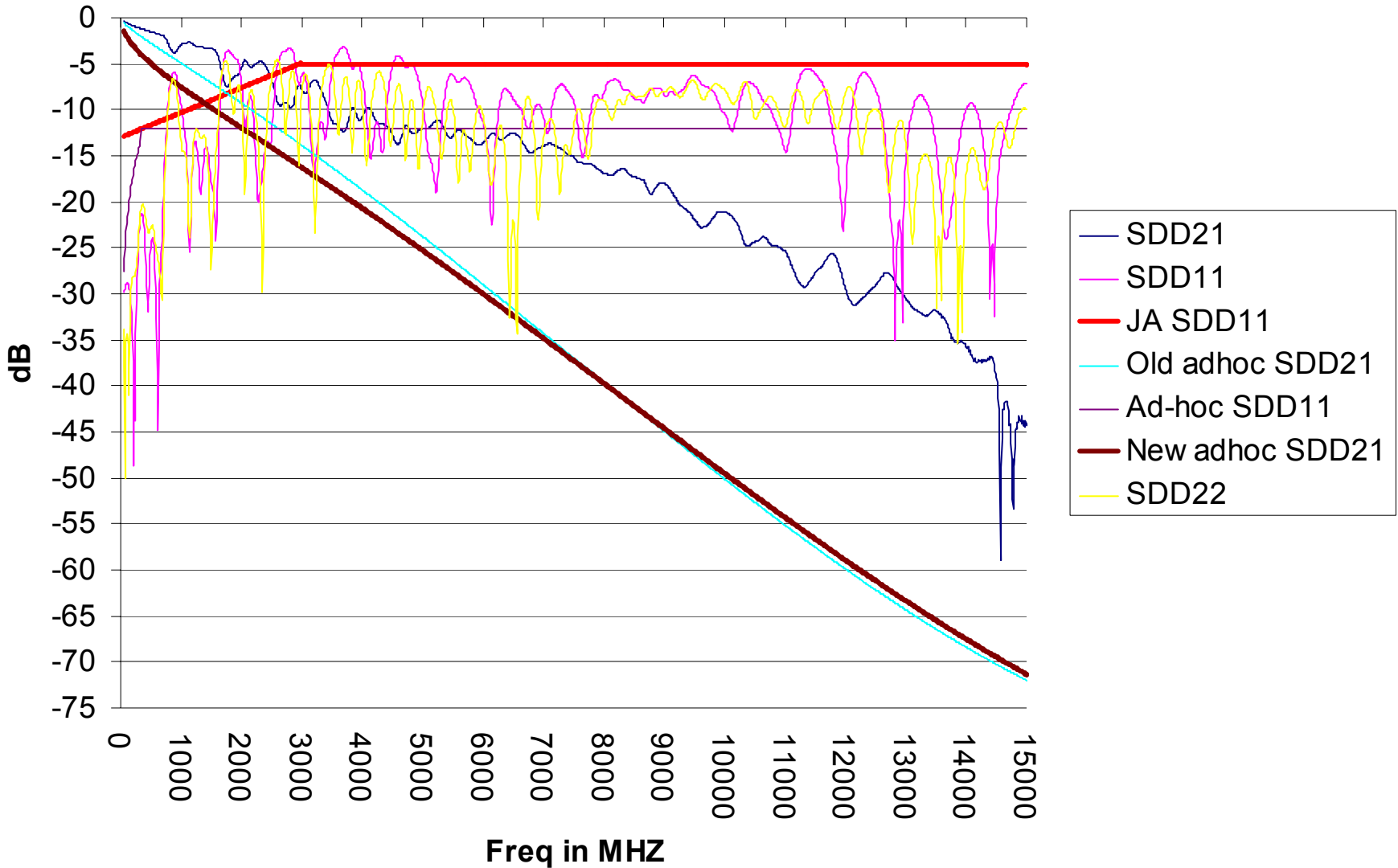
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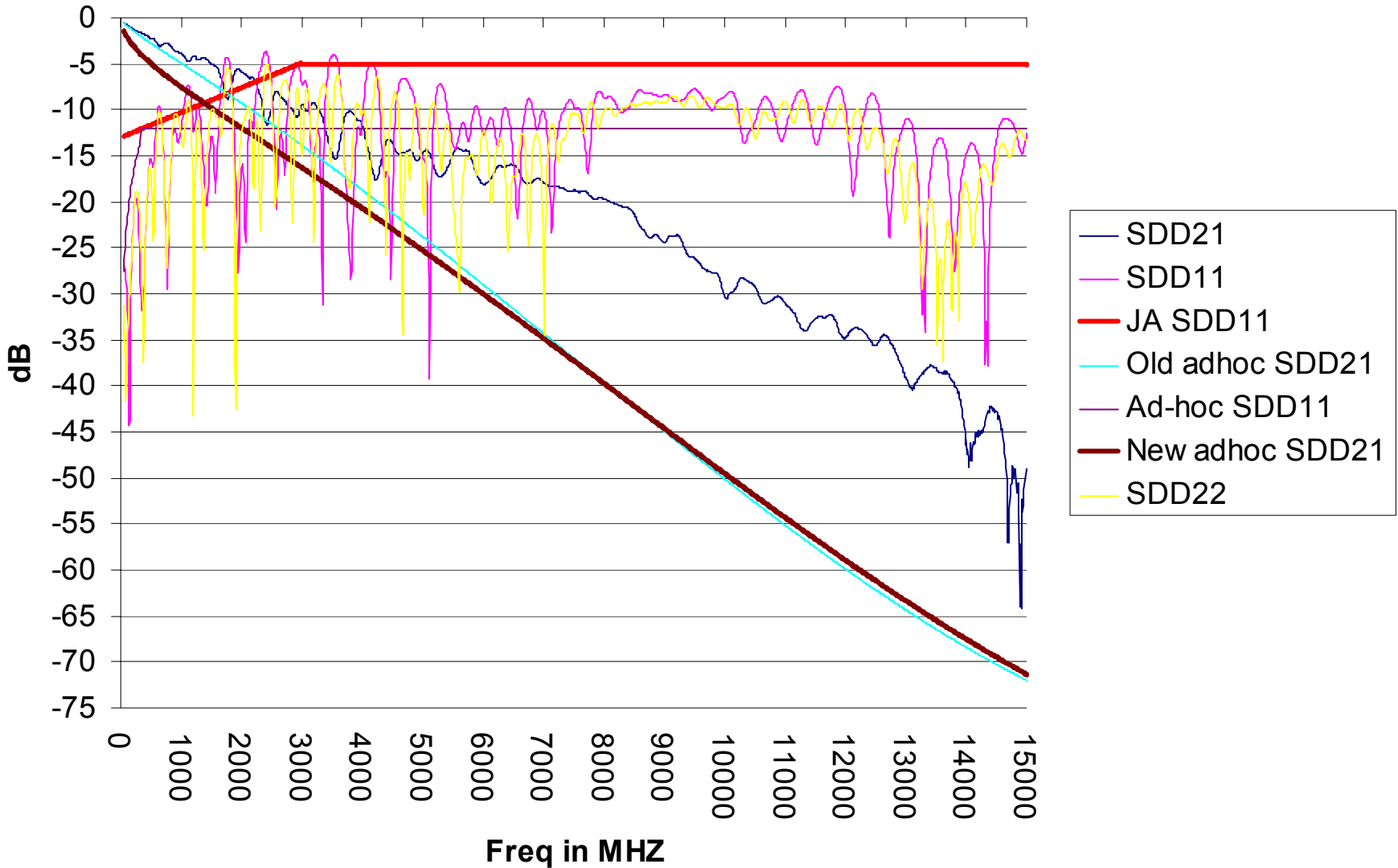
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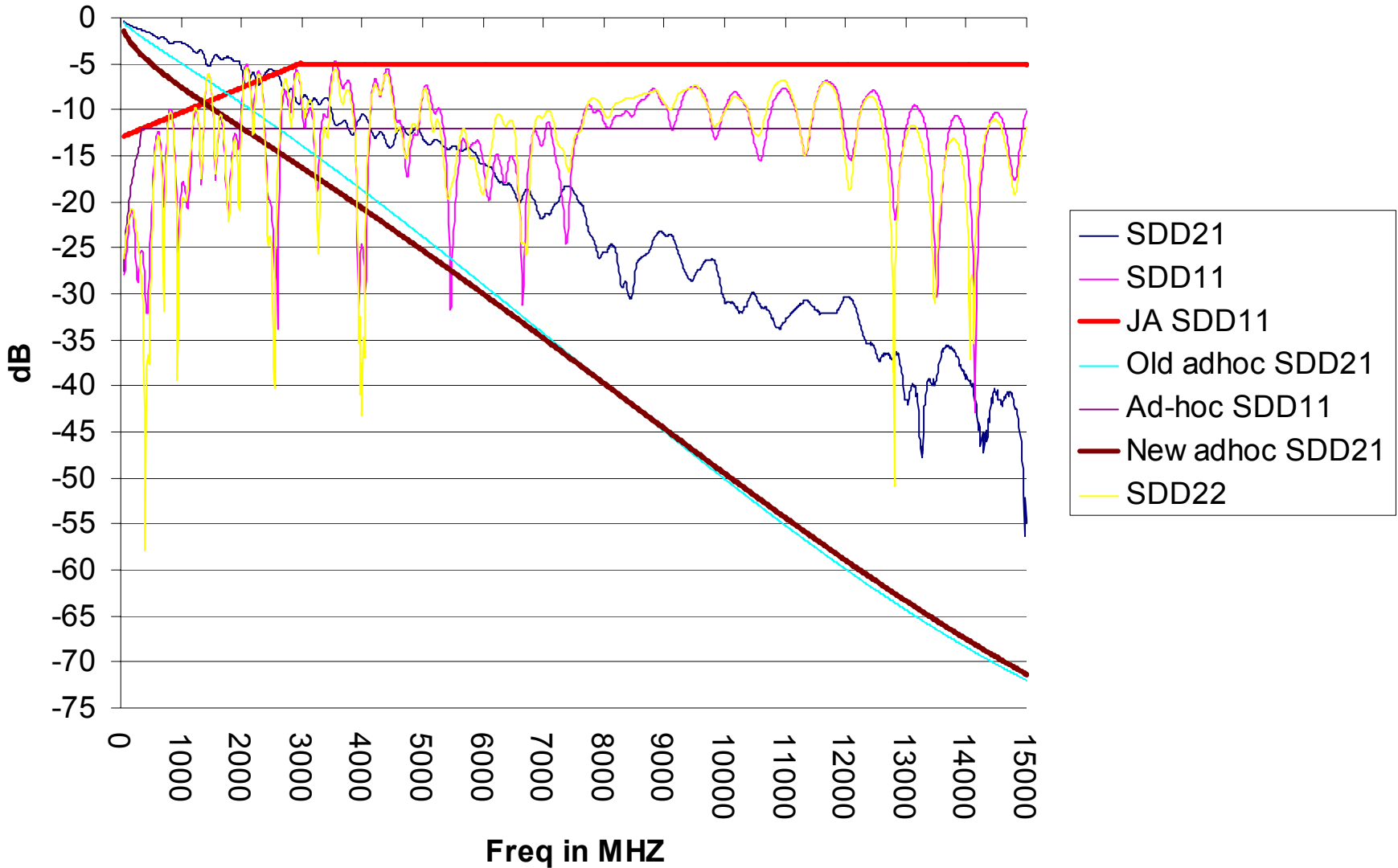
SDD21 SDD11 SDD22 CH4_3_3_3_7in N4000-13



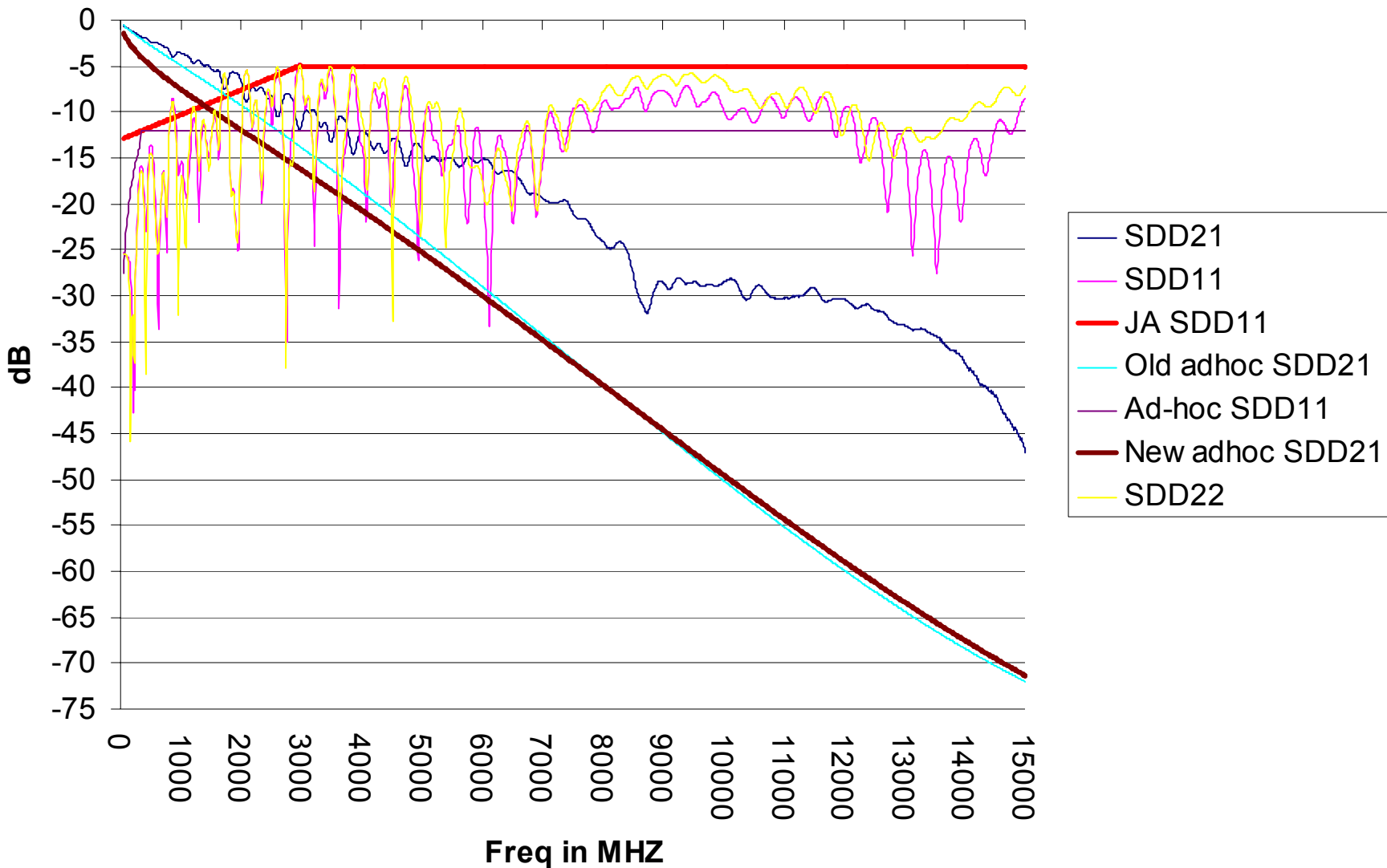
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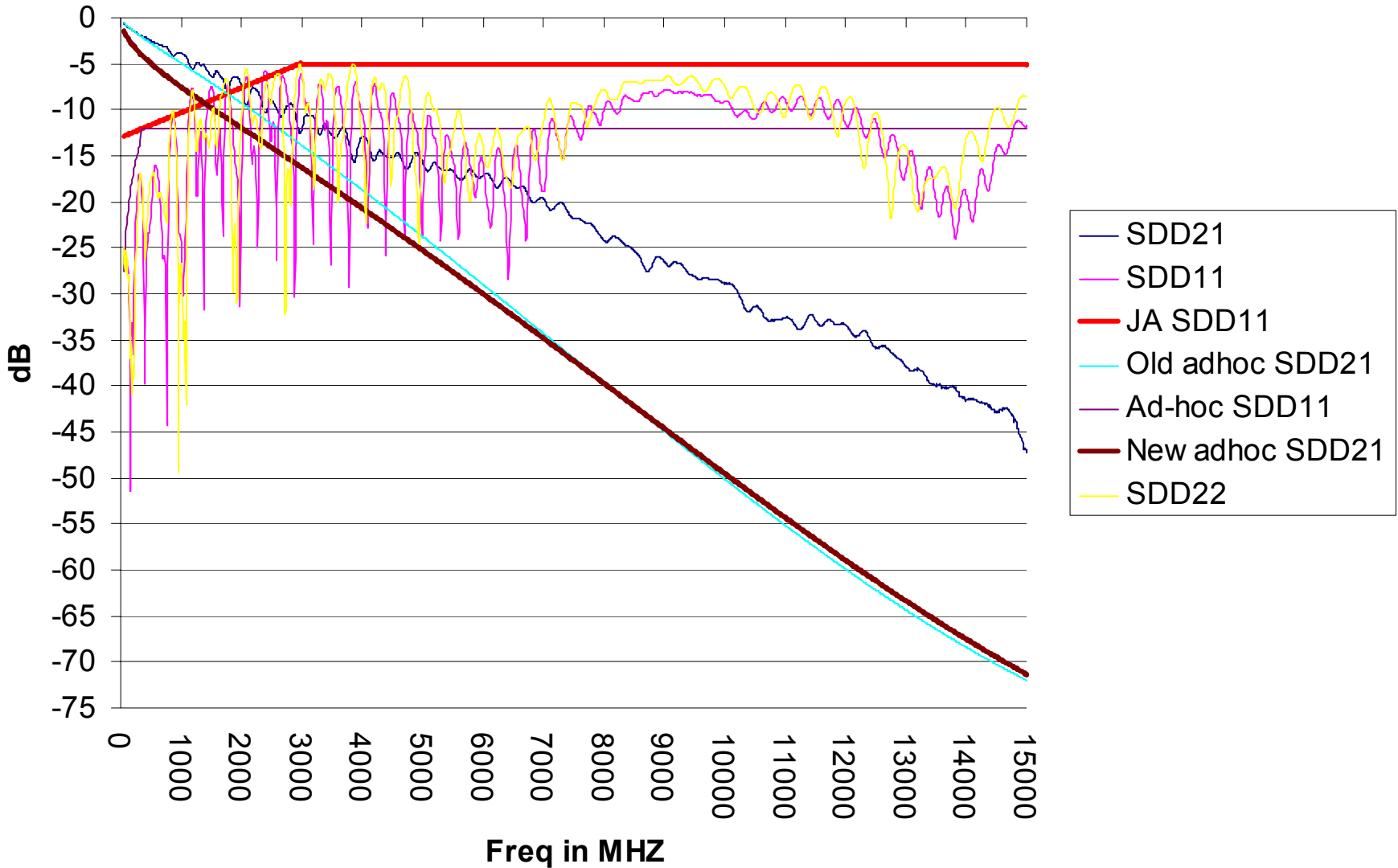
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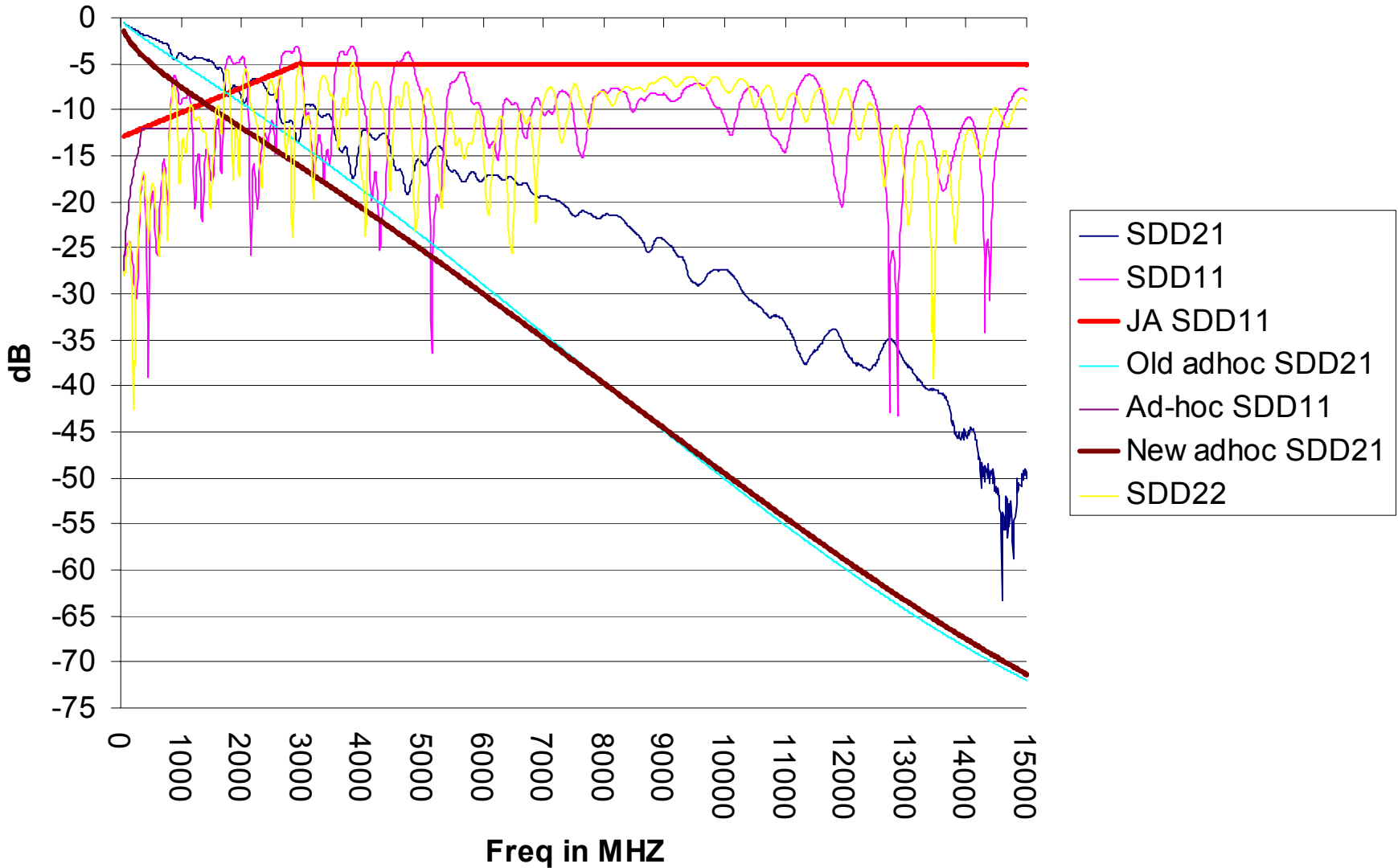
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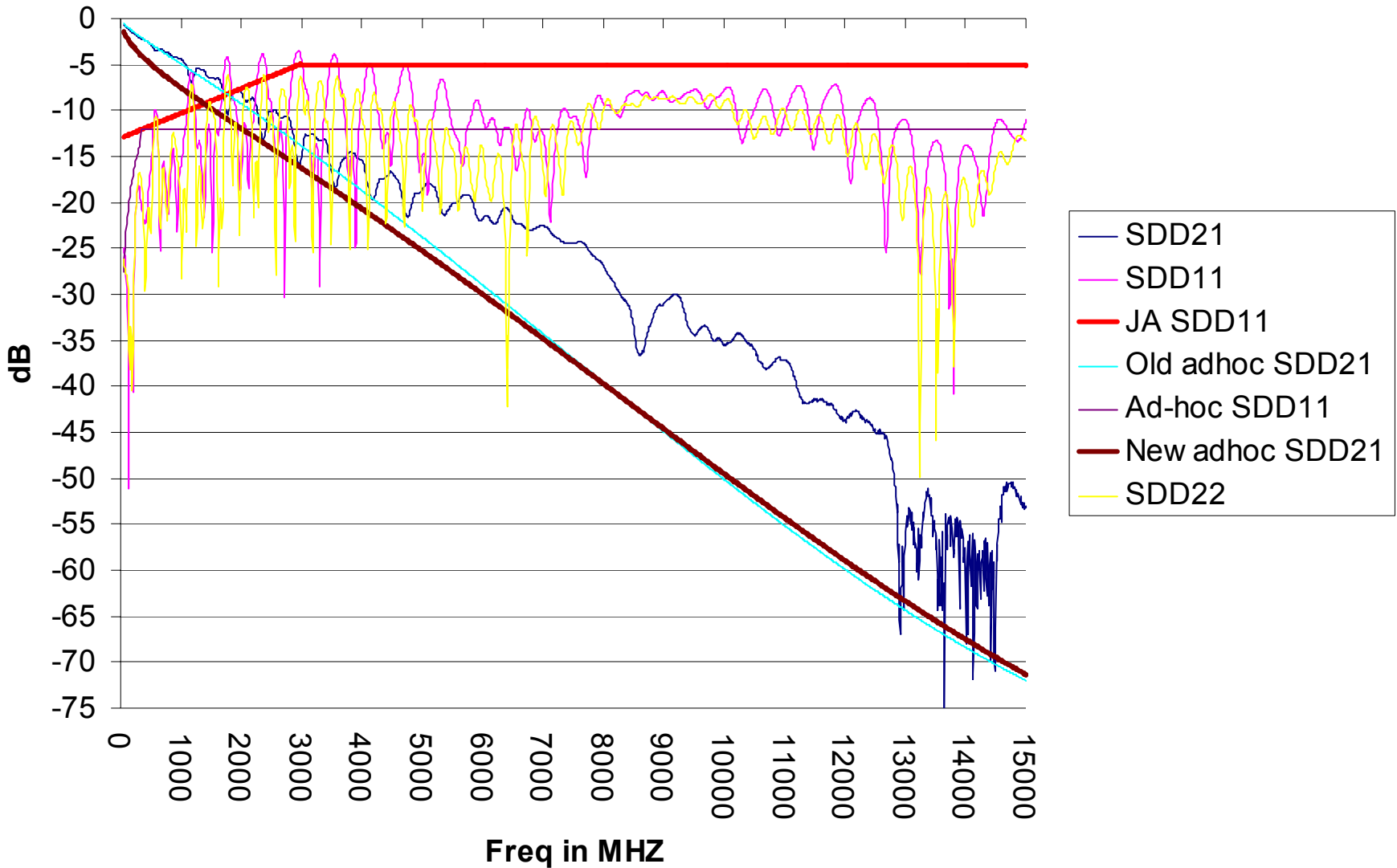
SDD21 SDD11 SDD22 CH8_10_10_10in N4000-13



SDD21 SDD11 SDD22 CH9_3_3_10_7in N4000-13

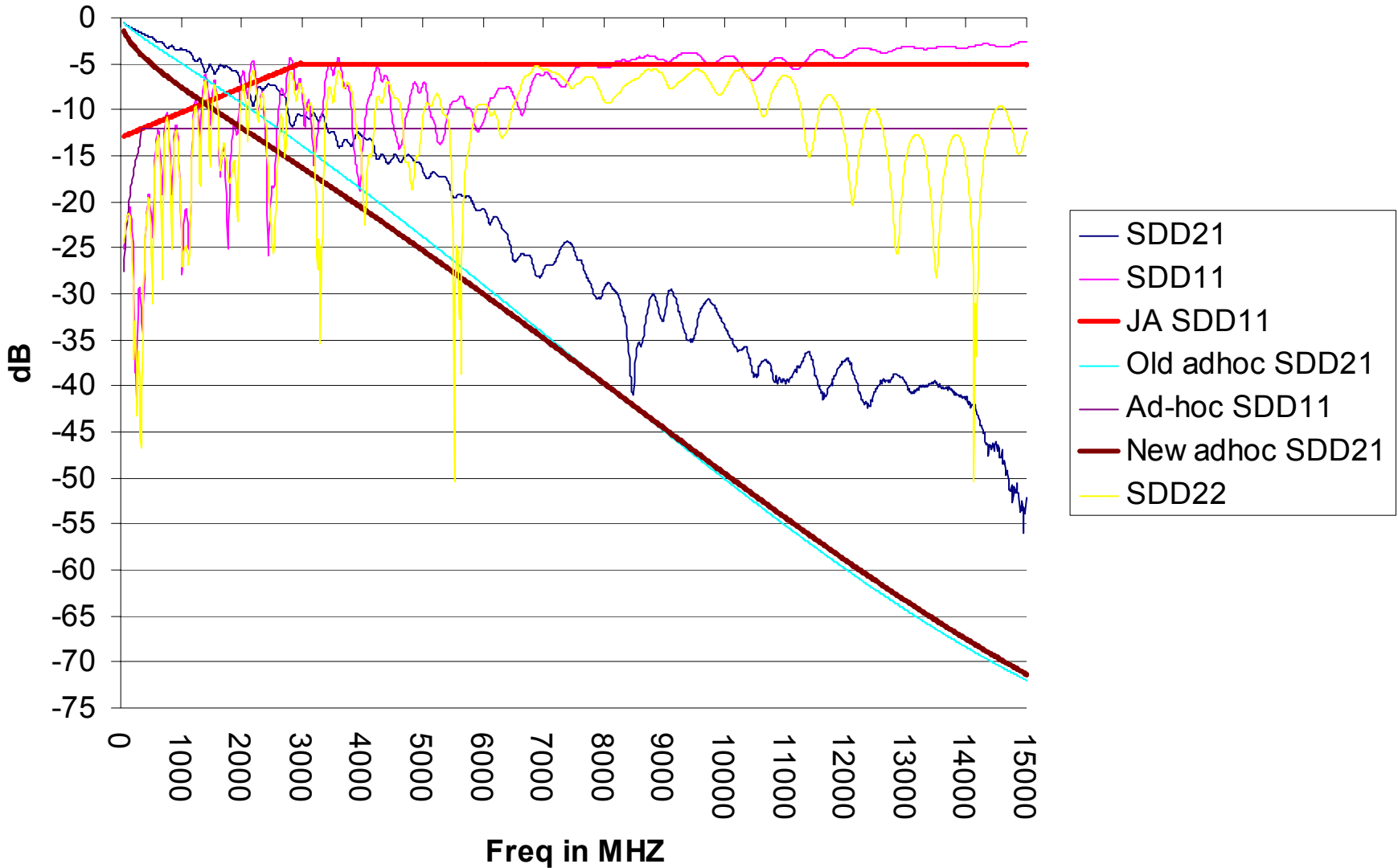


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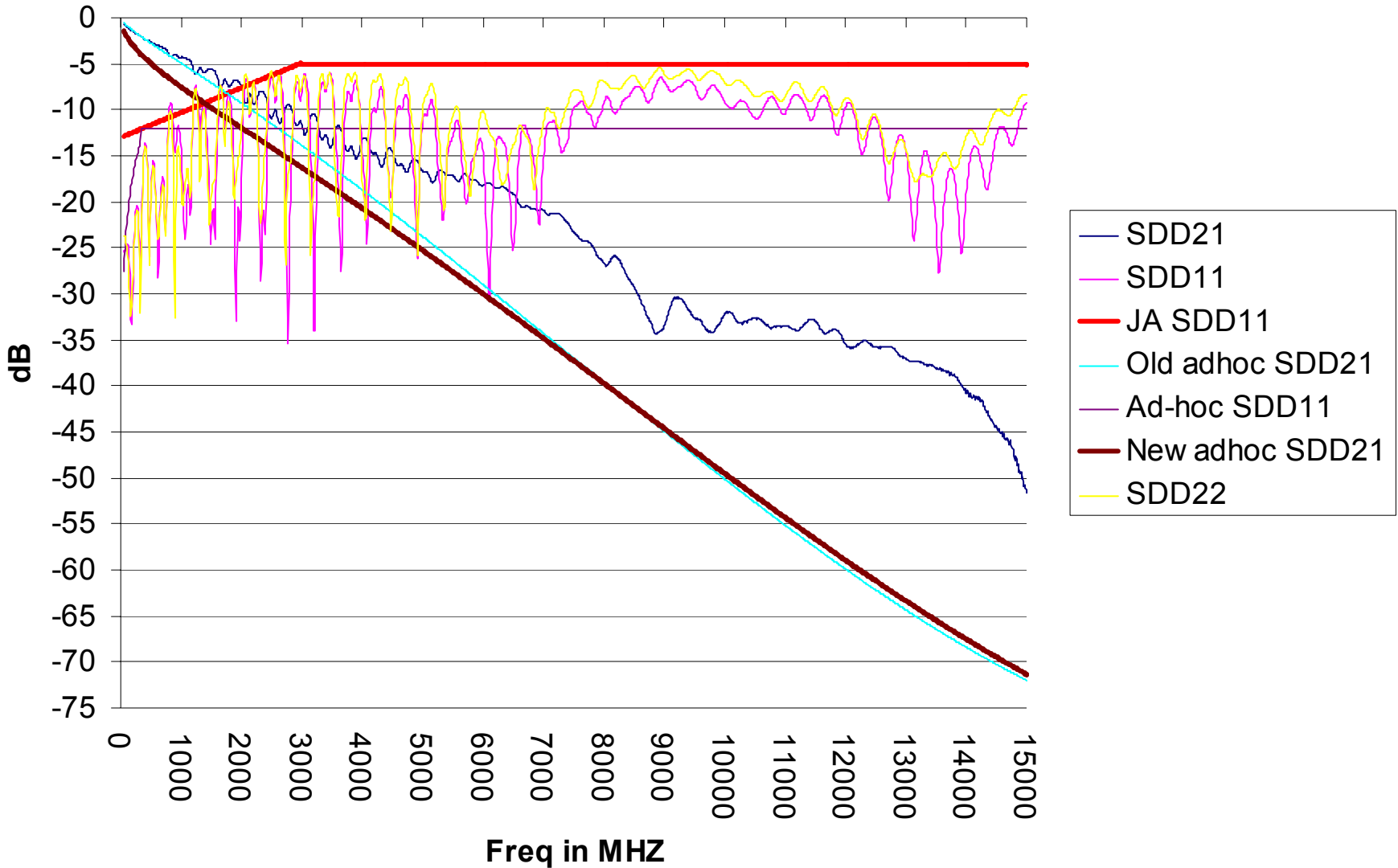


Channel Data CH11

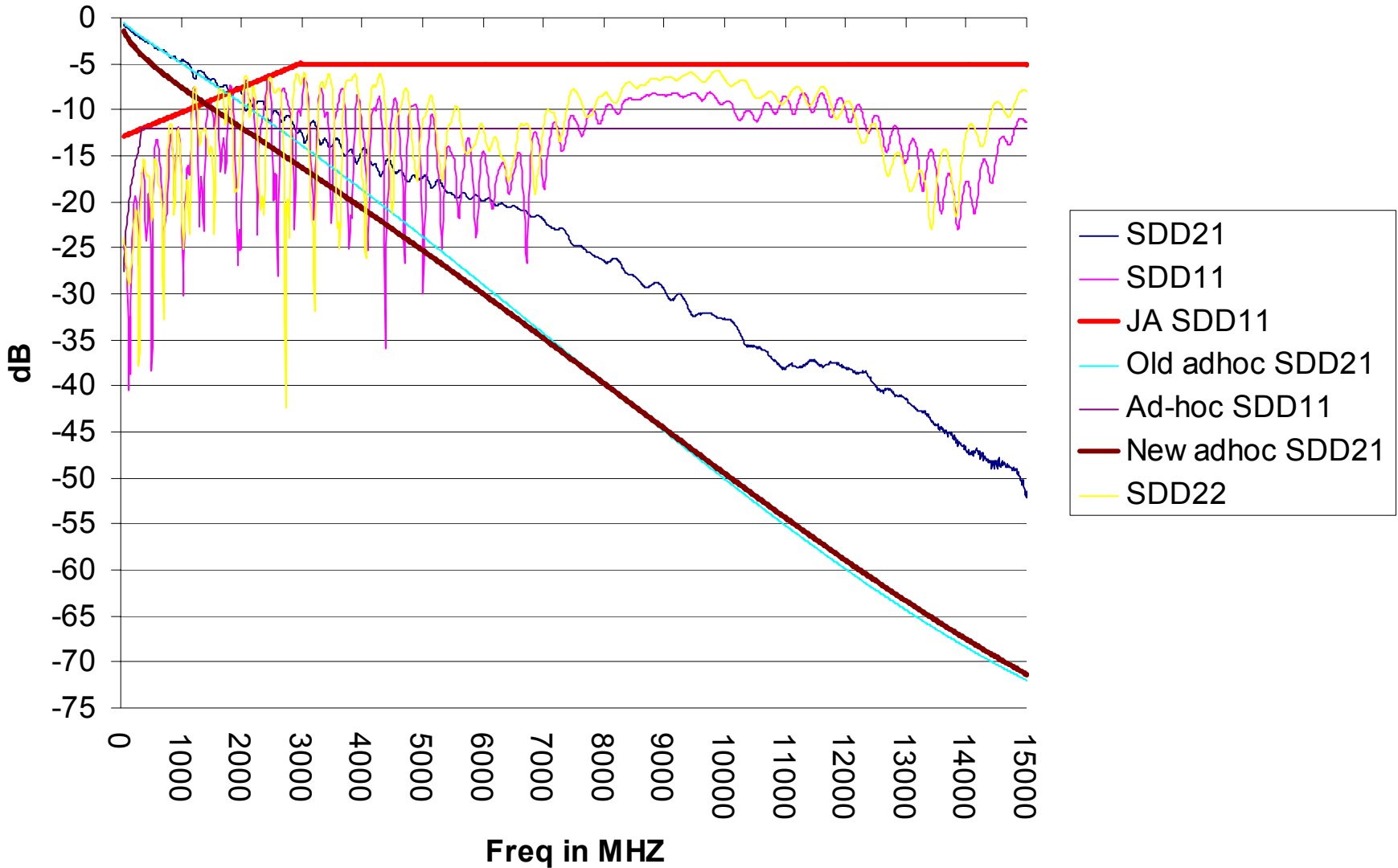
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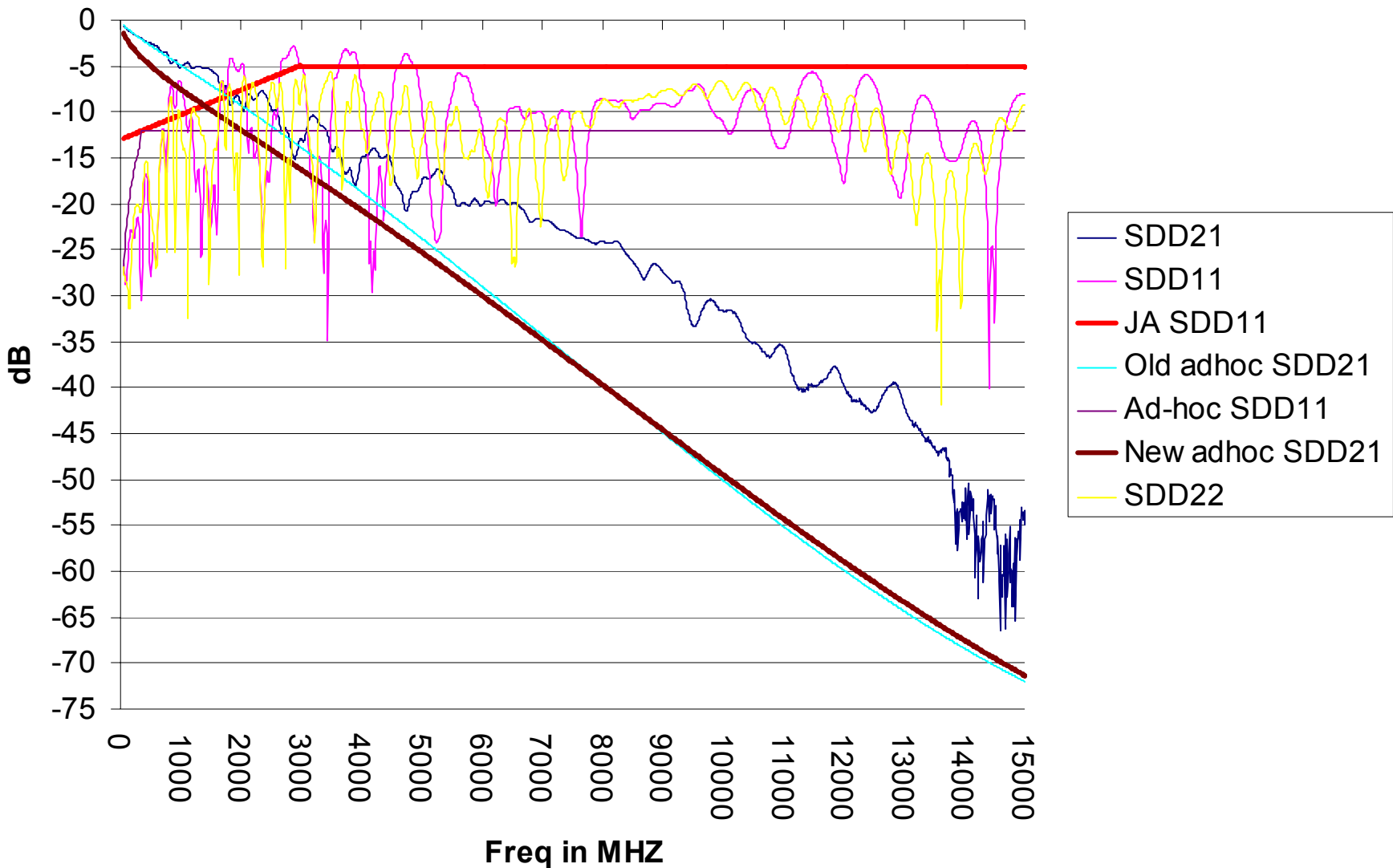
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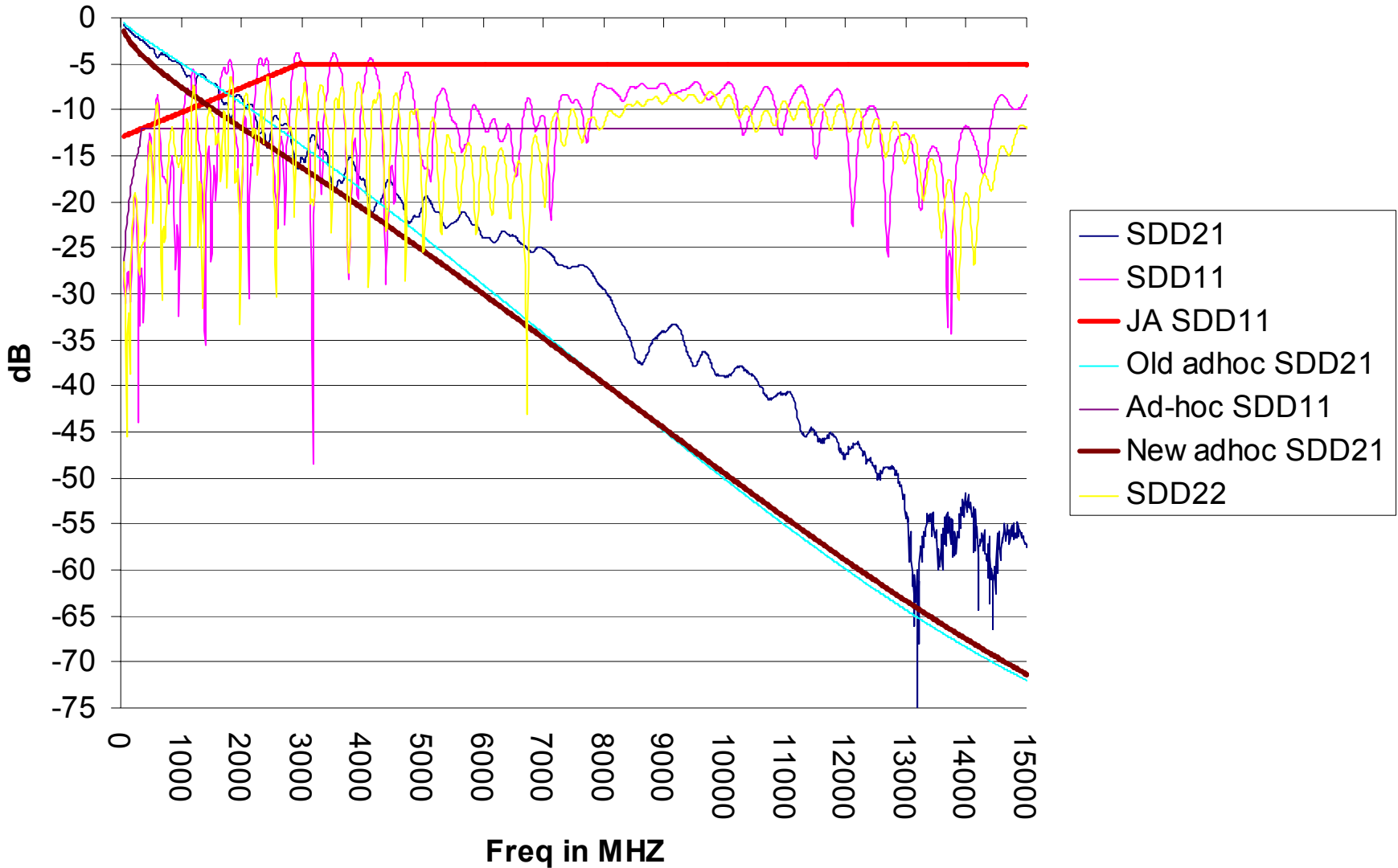
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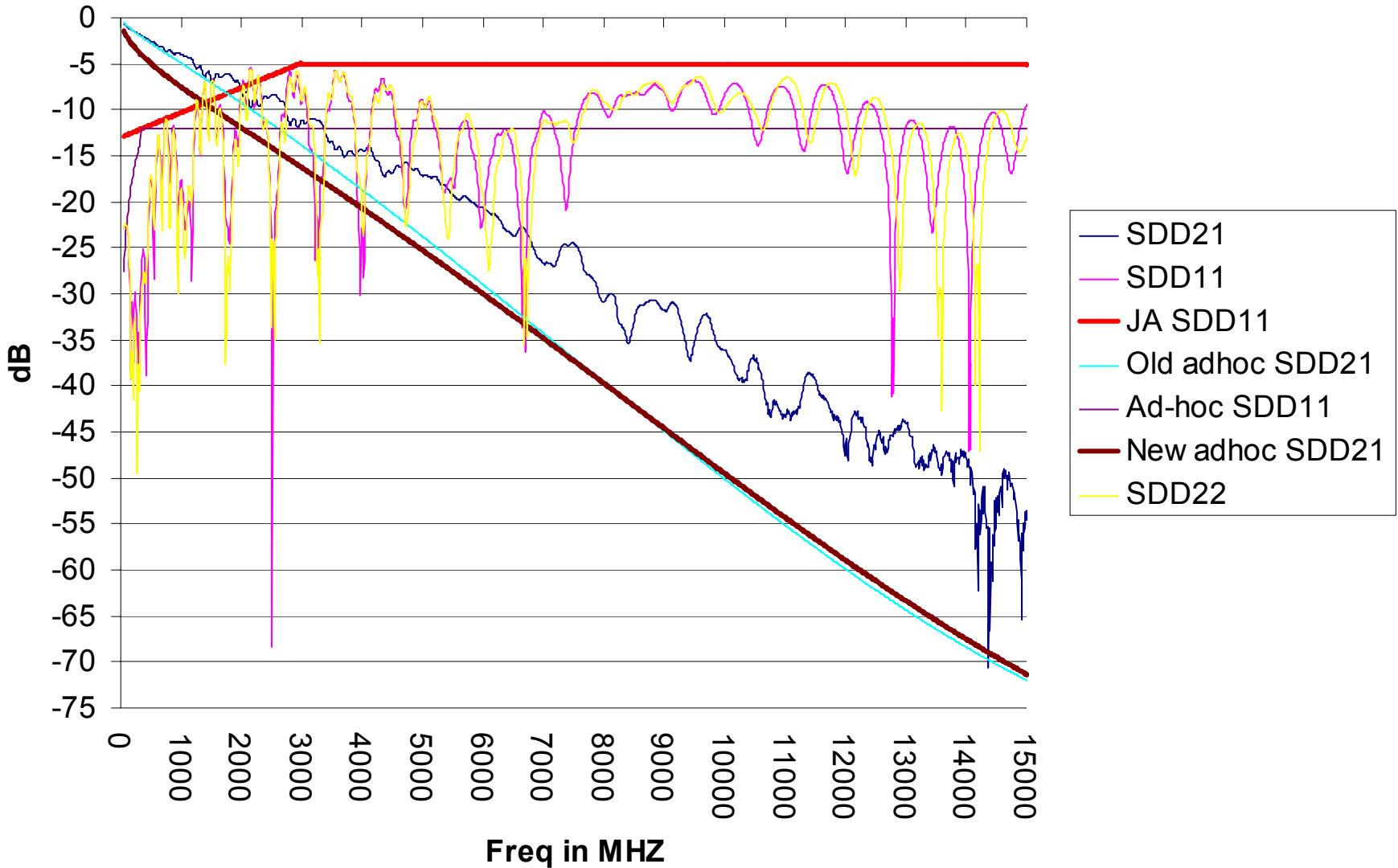
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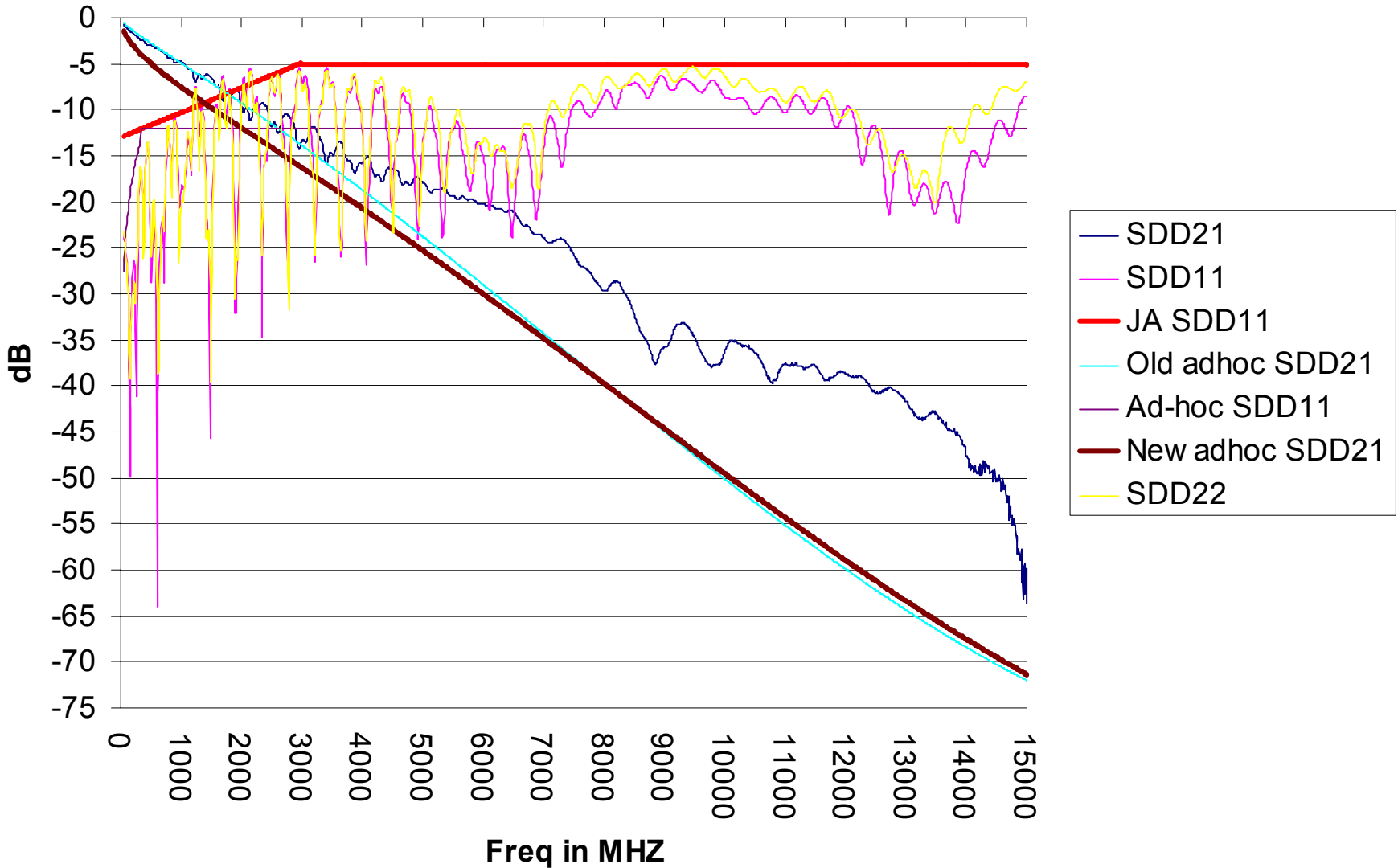
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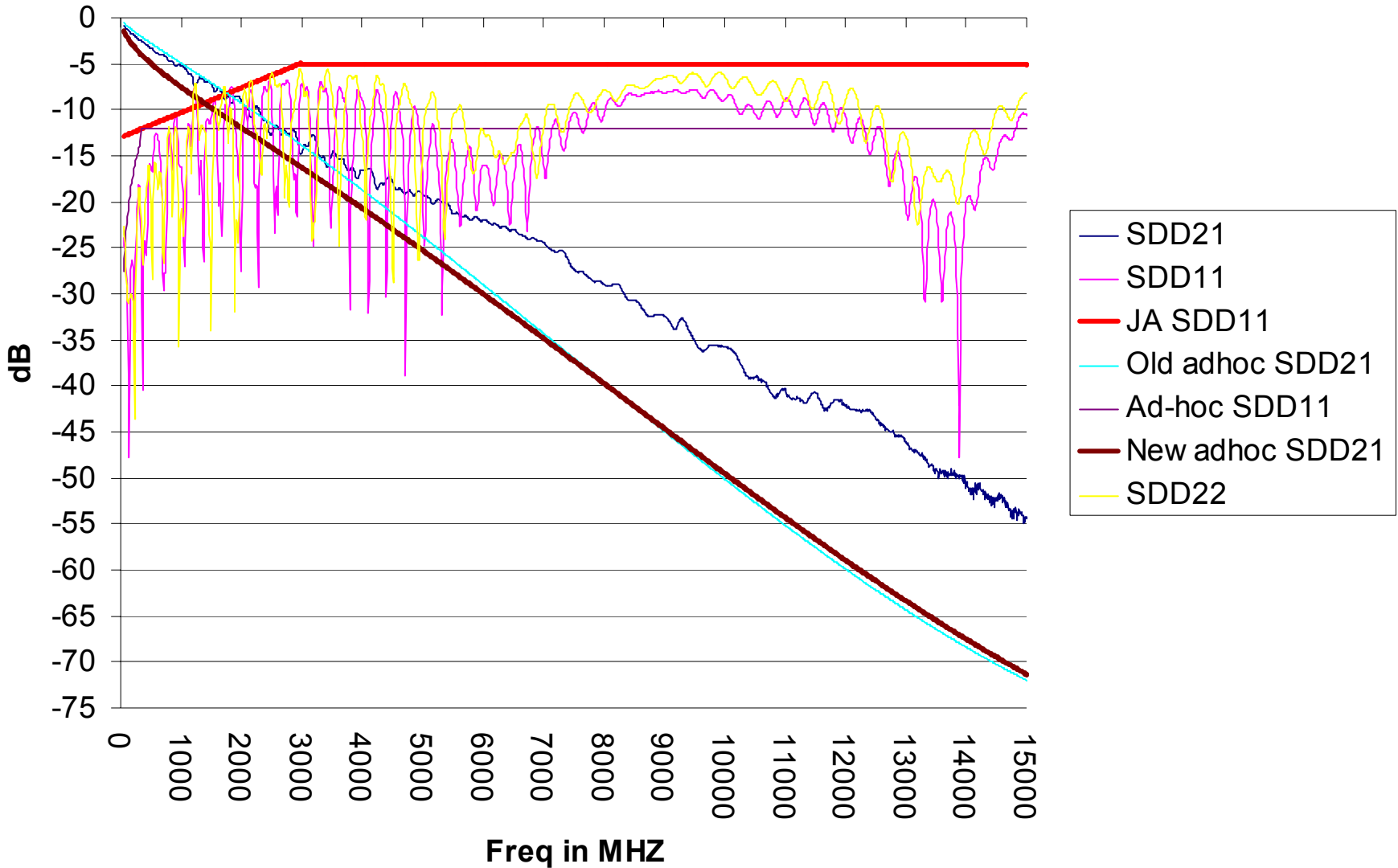
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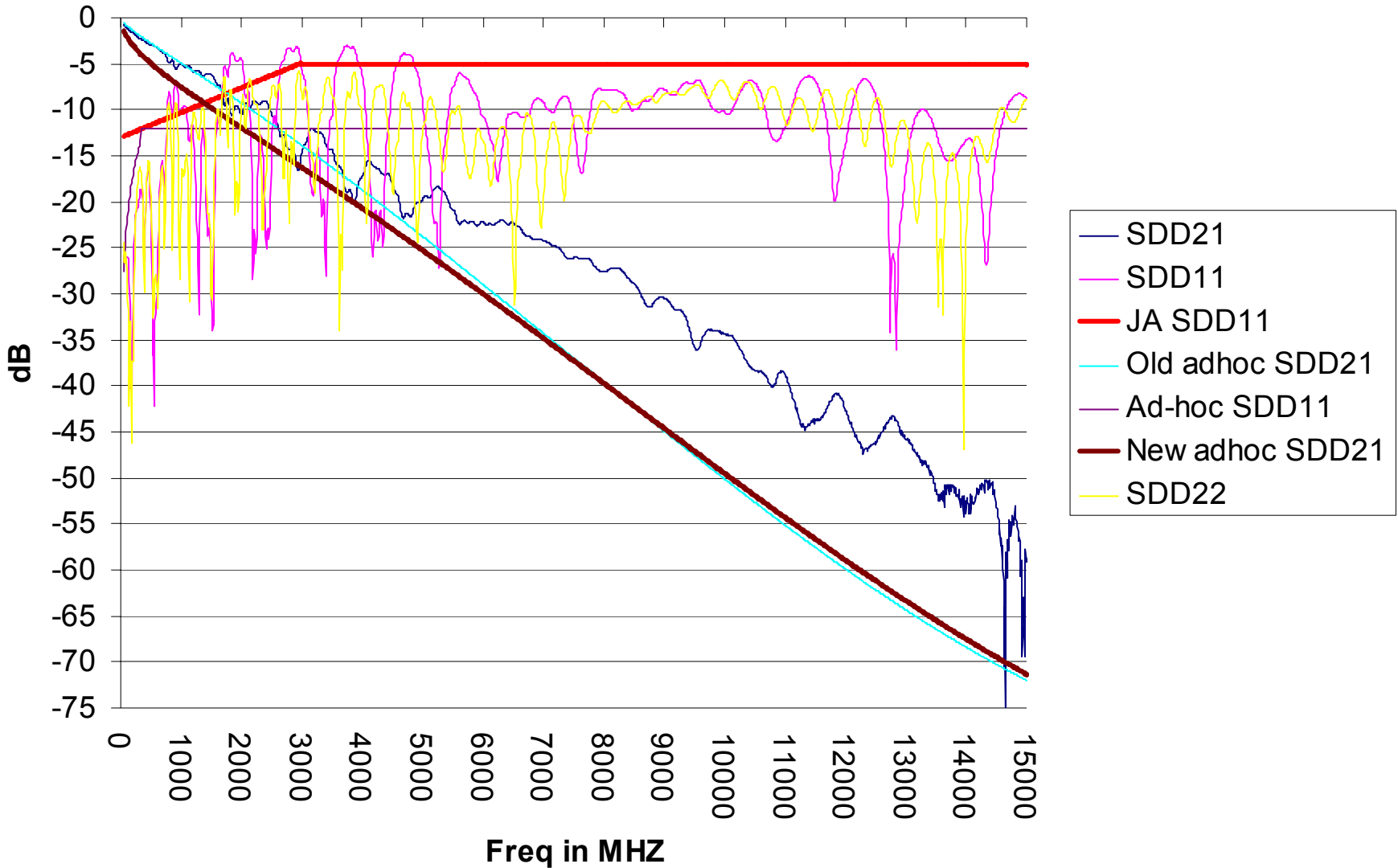
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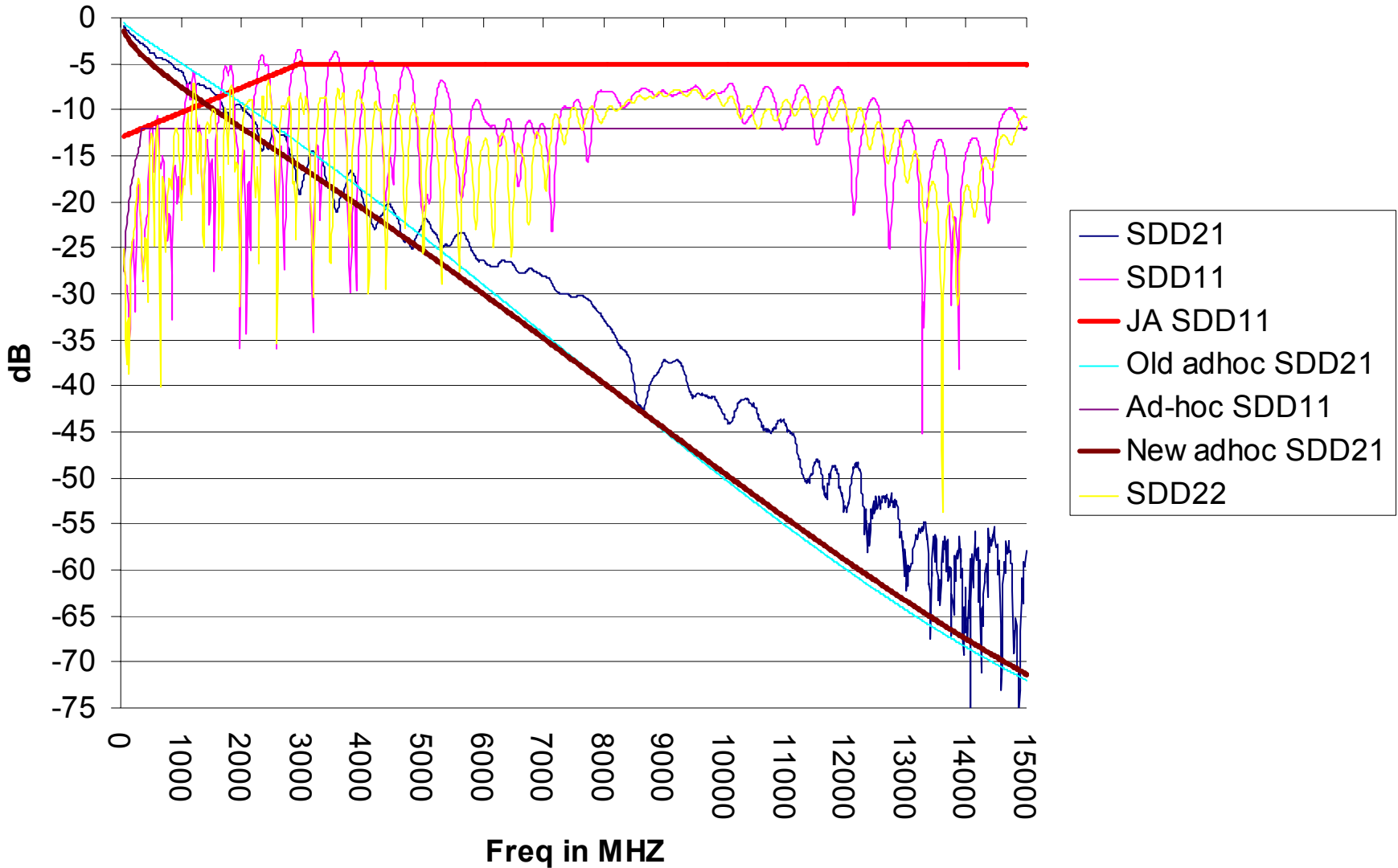
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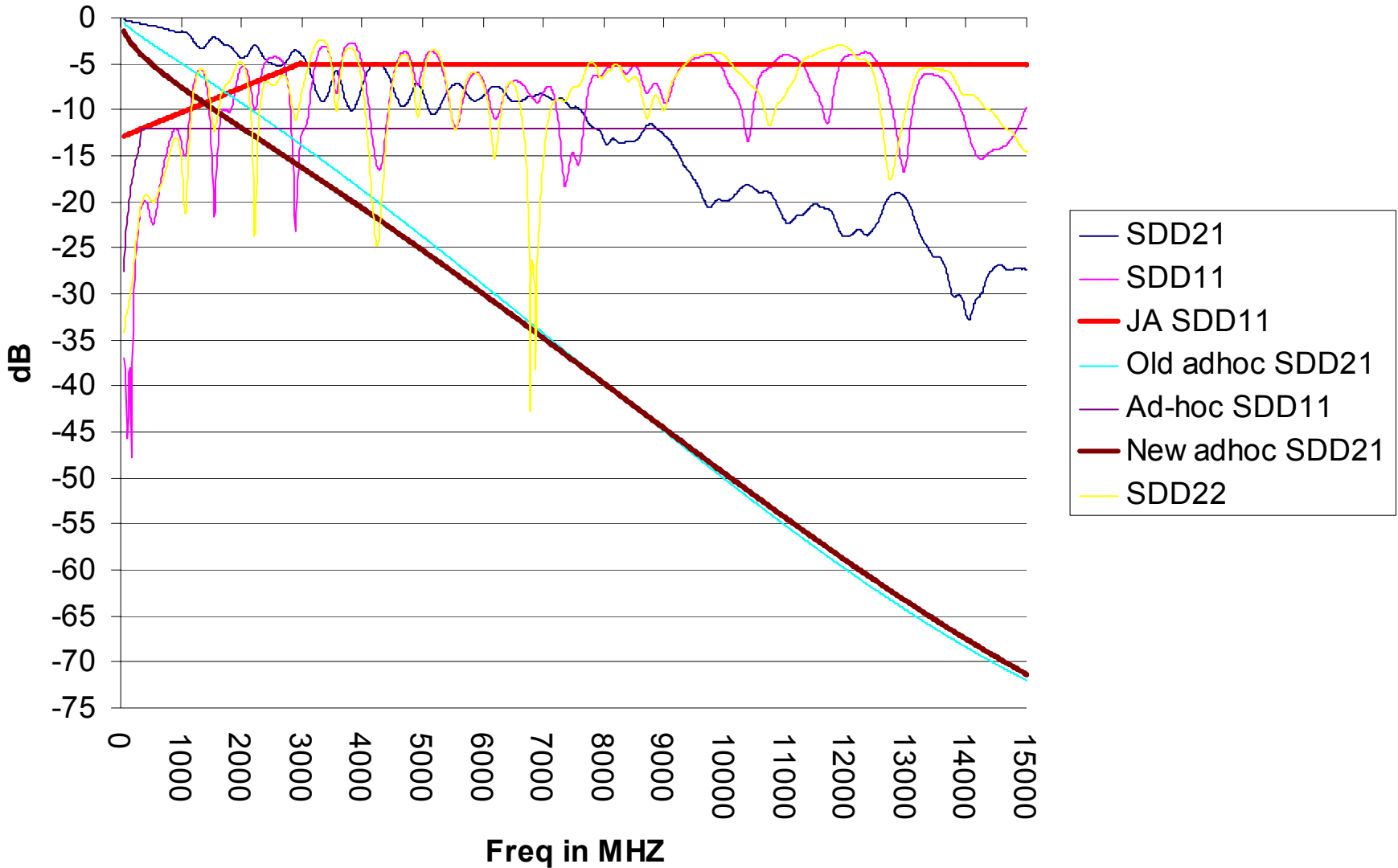
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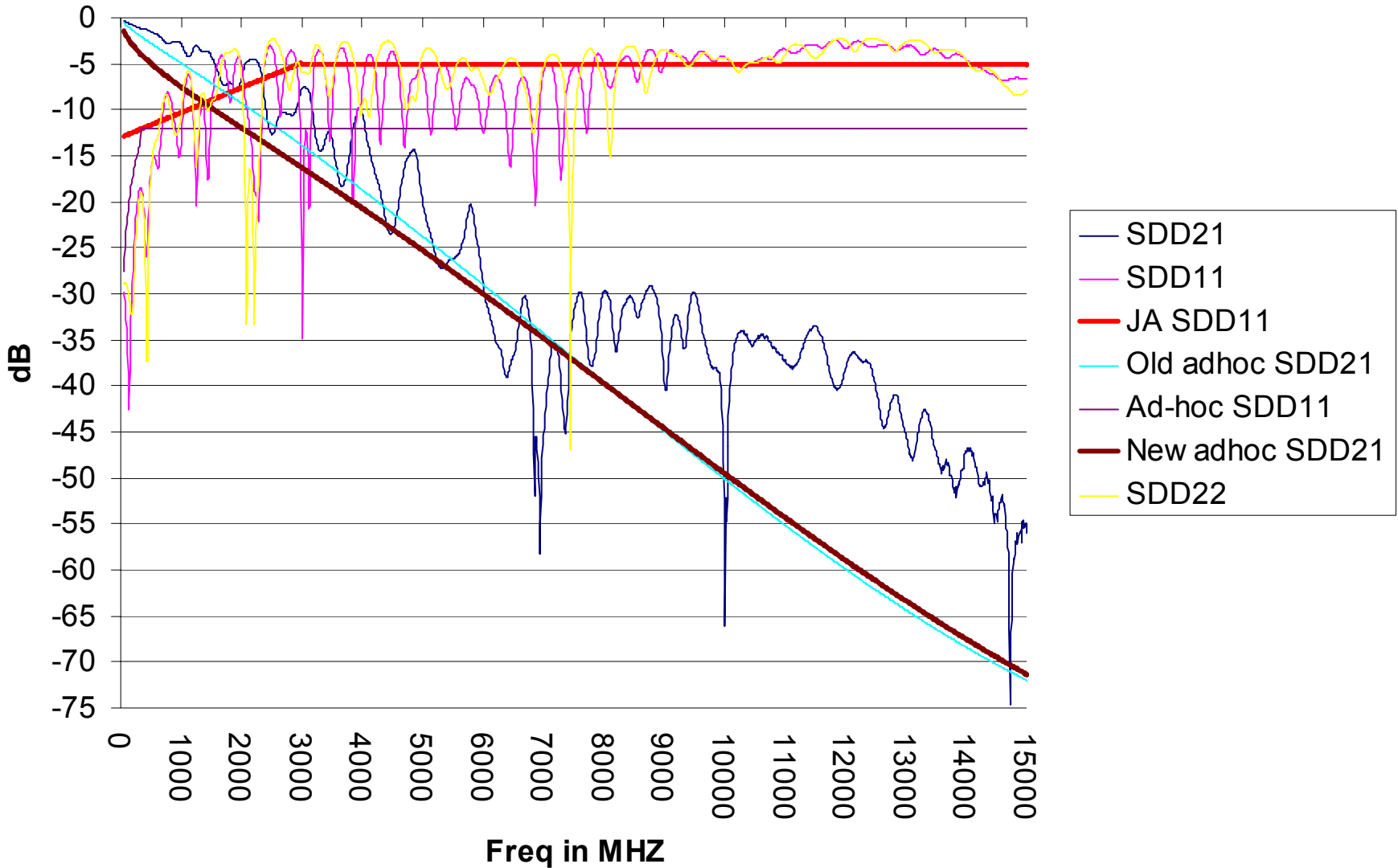
SDD21 SDD11 SDD22 CH20_5_5_20_10in N4000-13



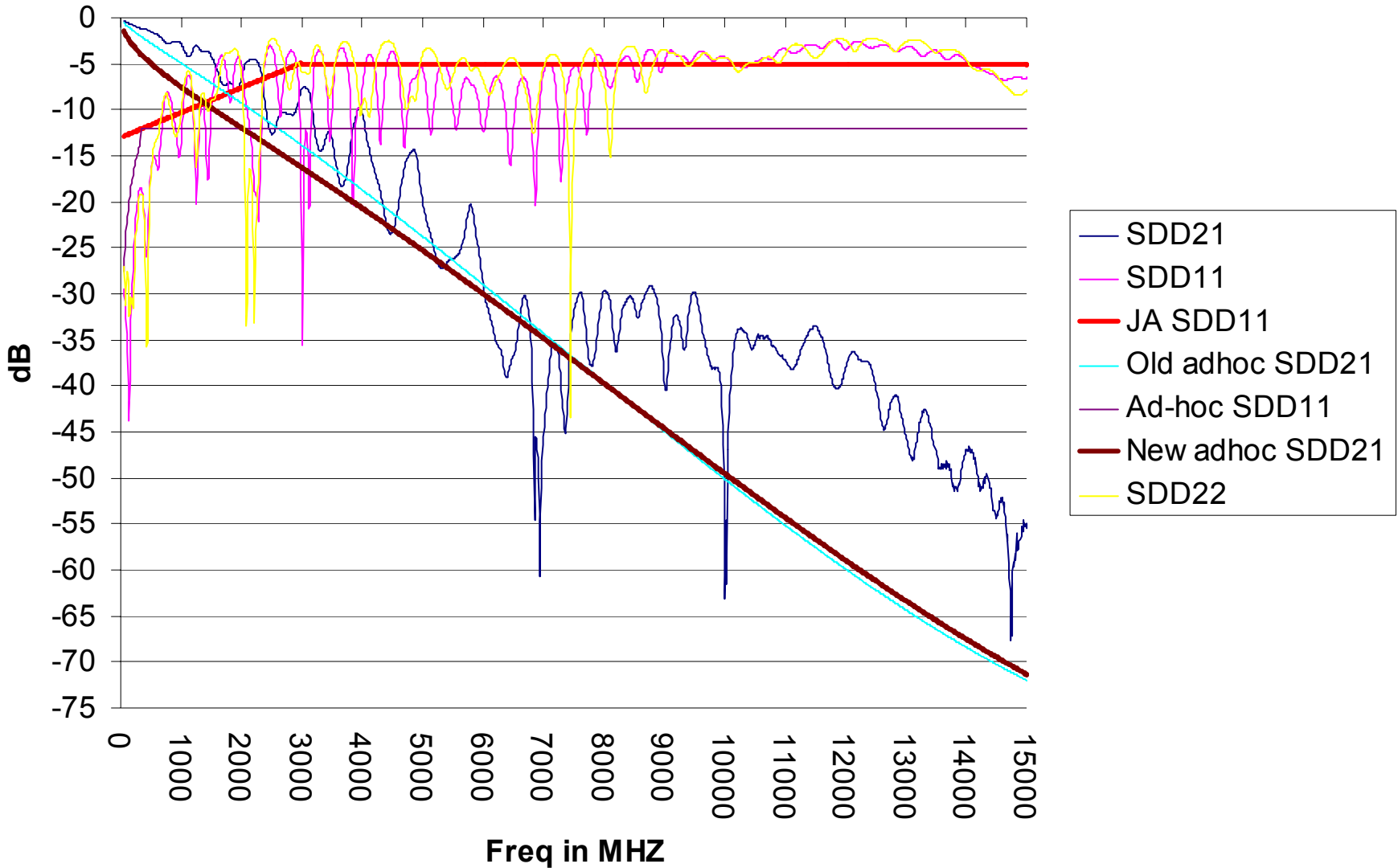
SDD21 SDD11 SDD22 CH2 AGGR0 N4000-13



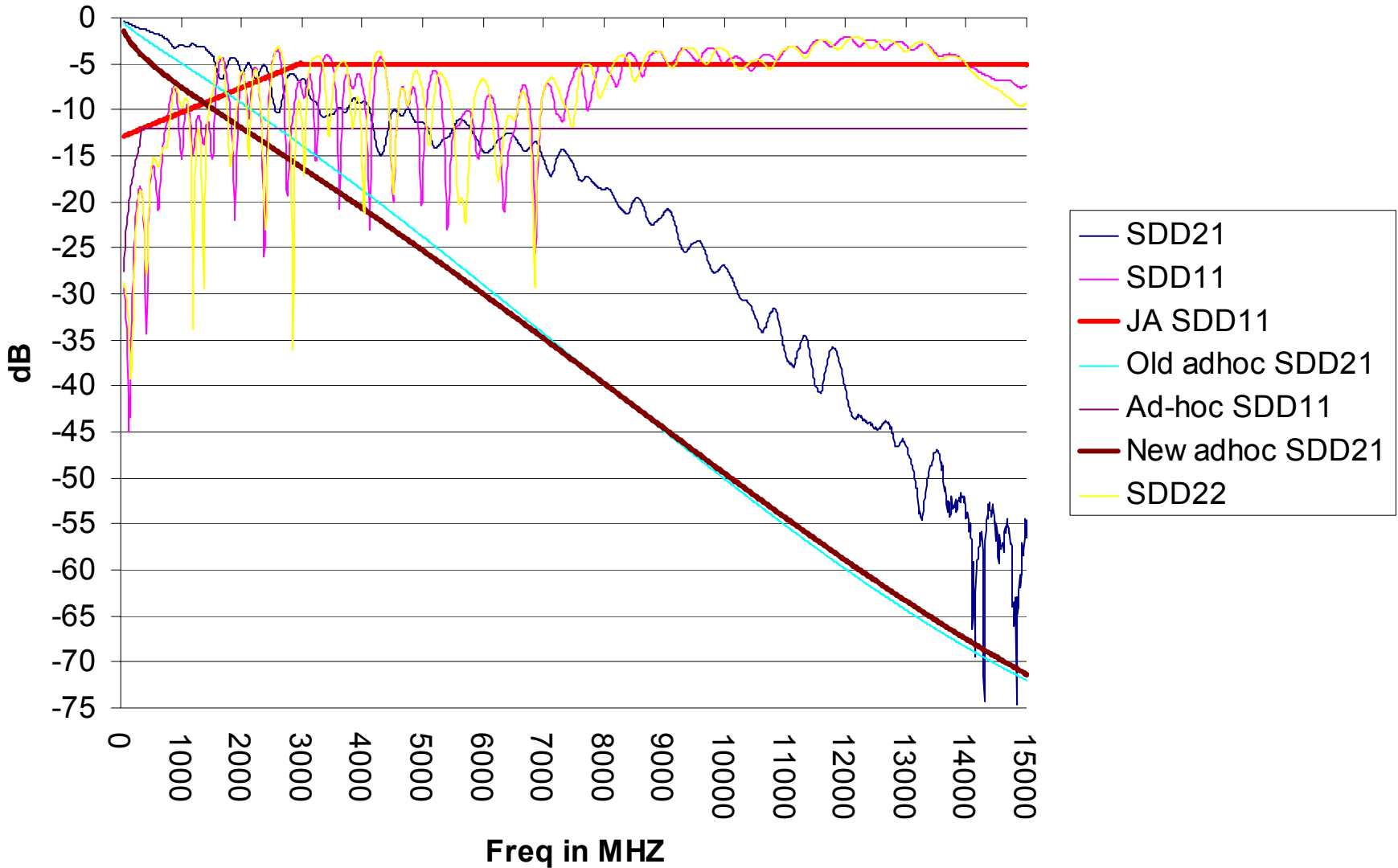
SDD21 SDD11 SDD22 CH2 AGGR1 N4000-13



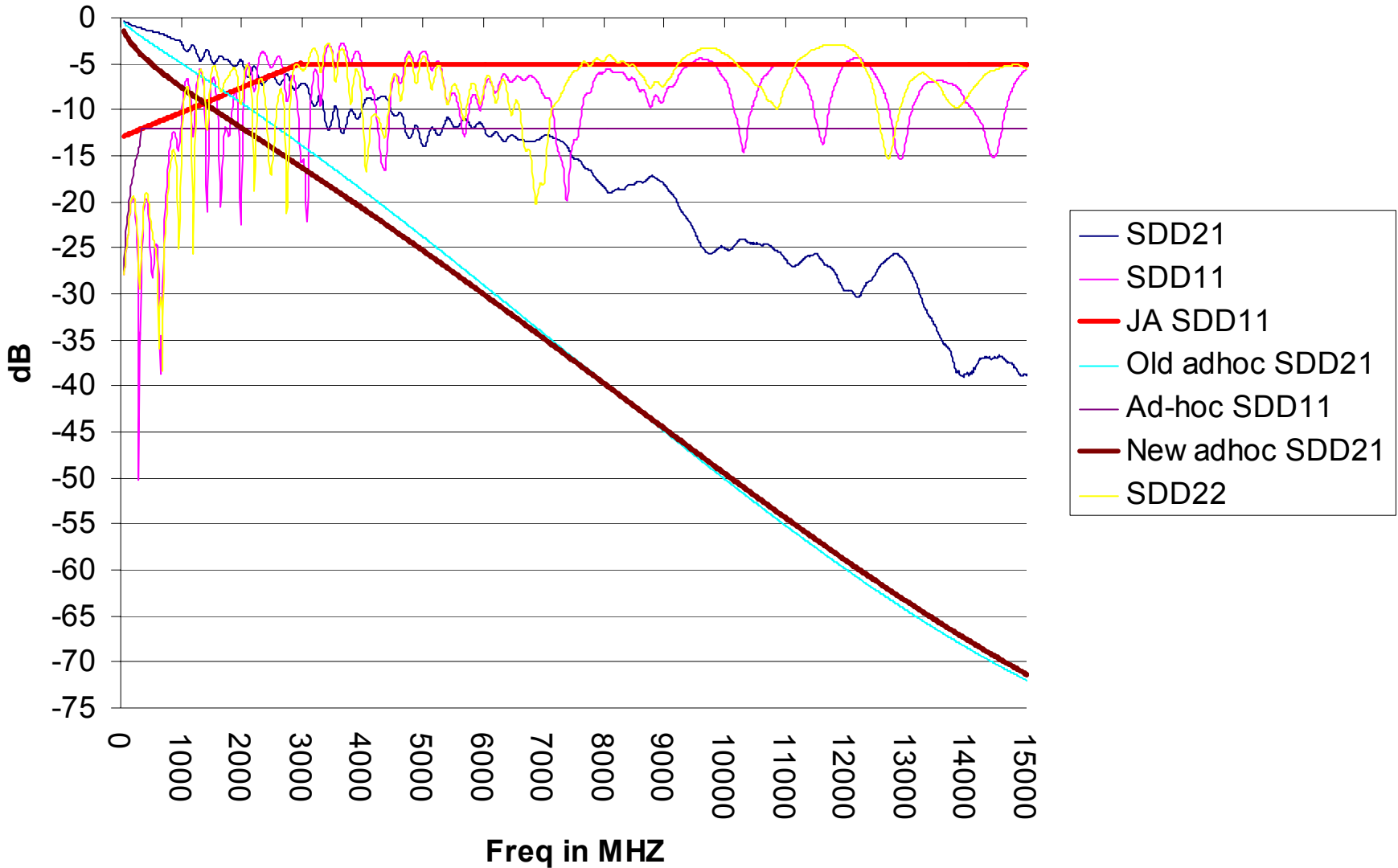
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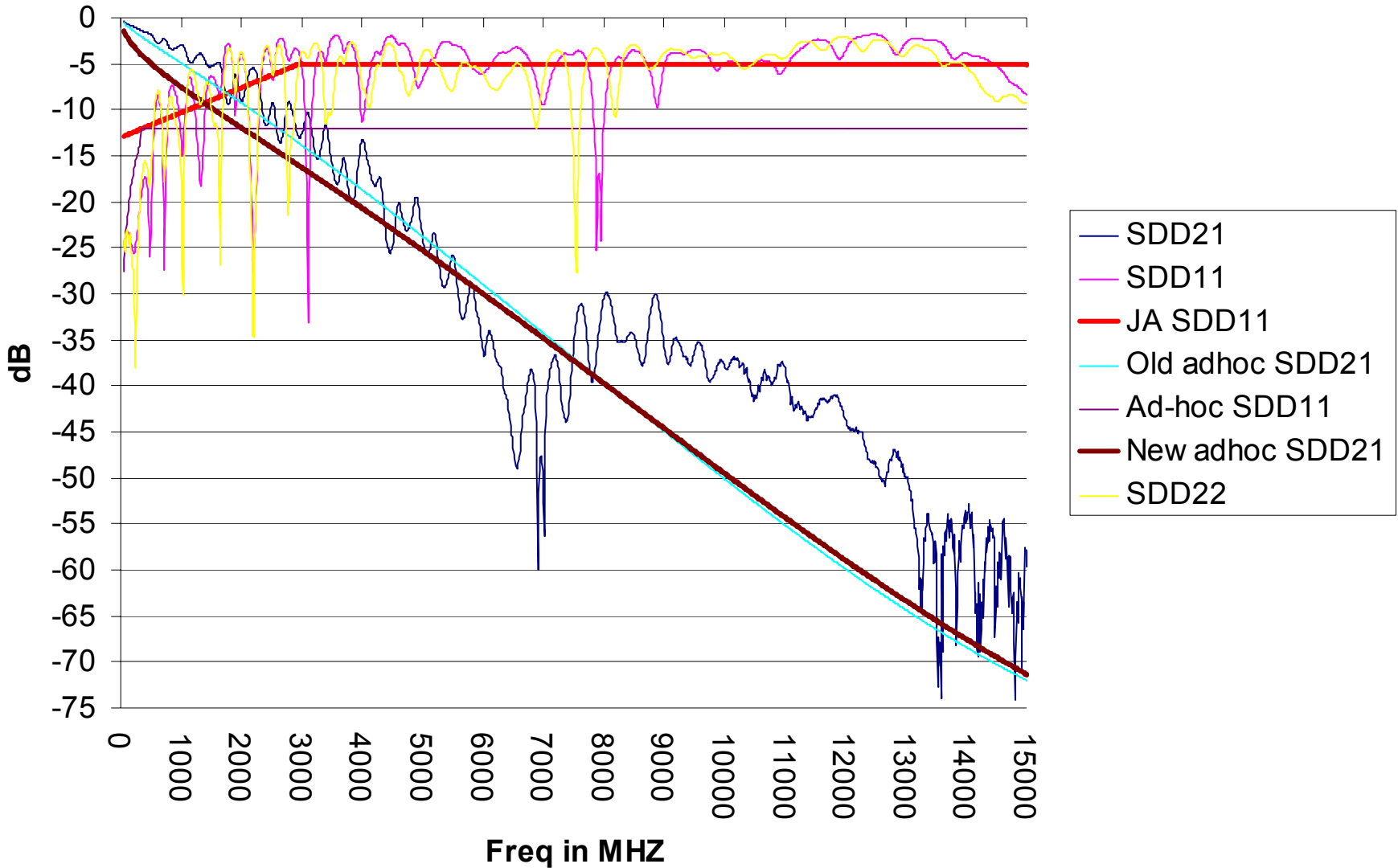
SDD21 SDD11 SDD22 CH2 AGGR3 N4000-13



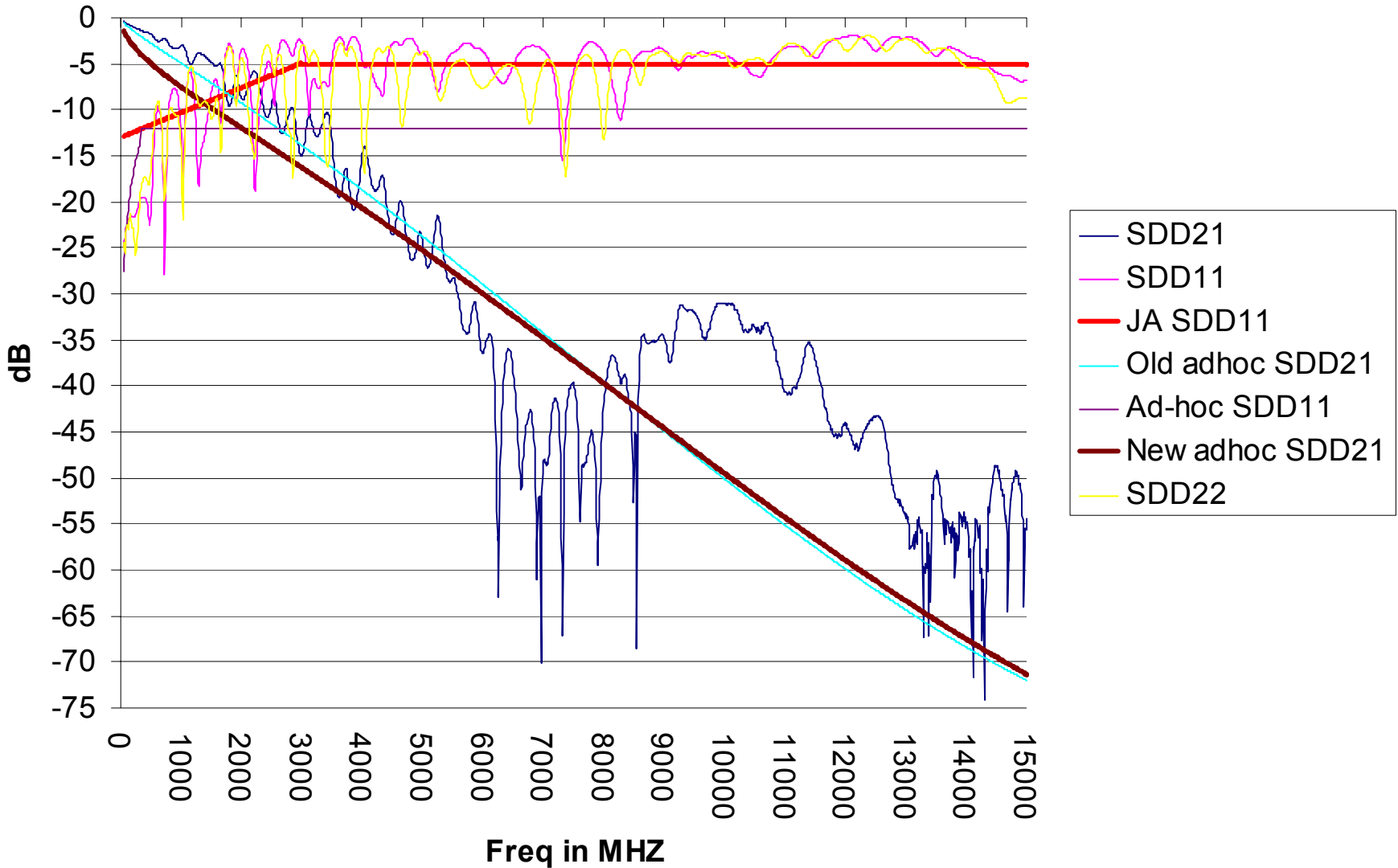
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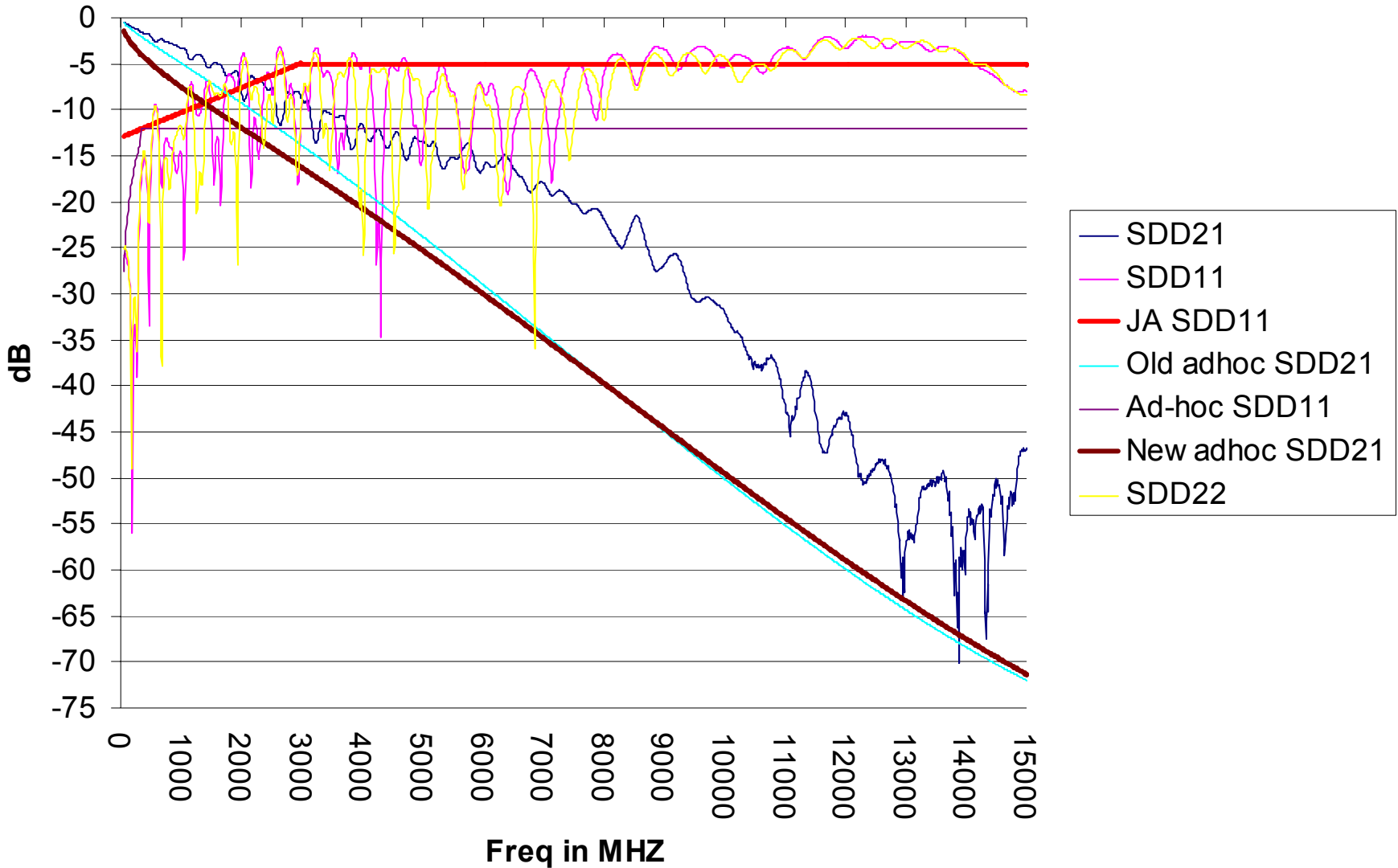
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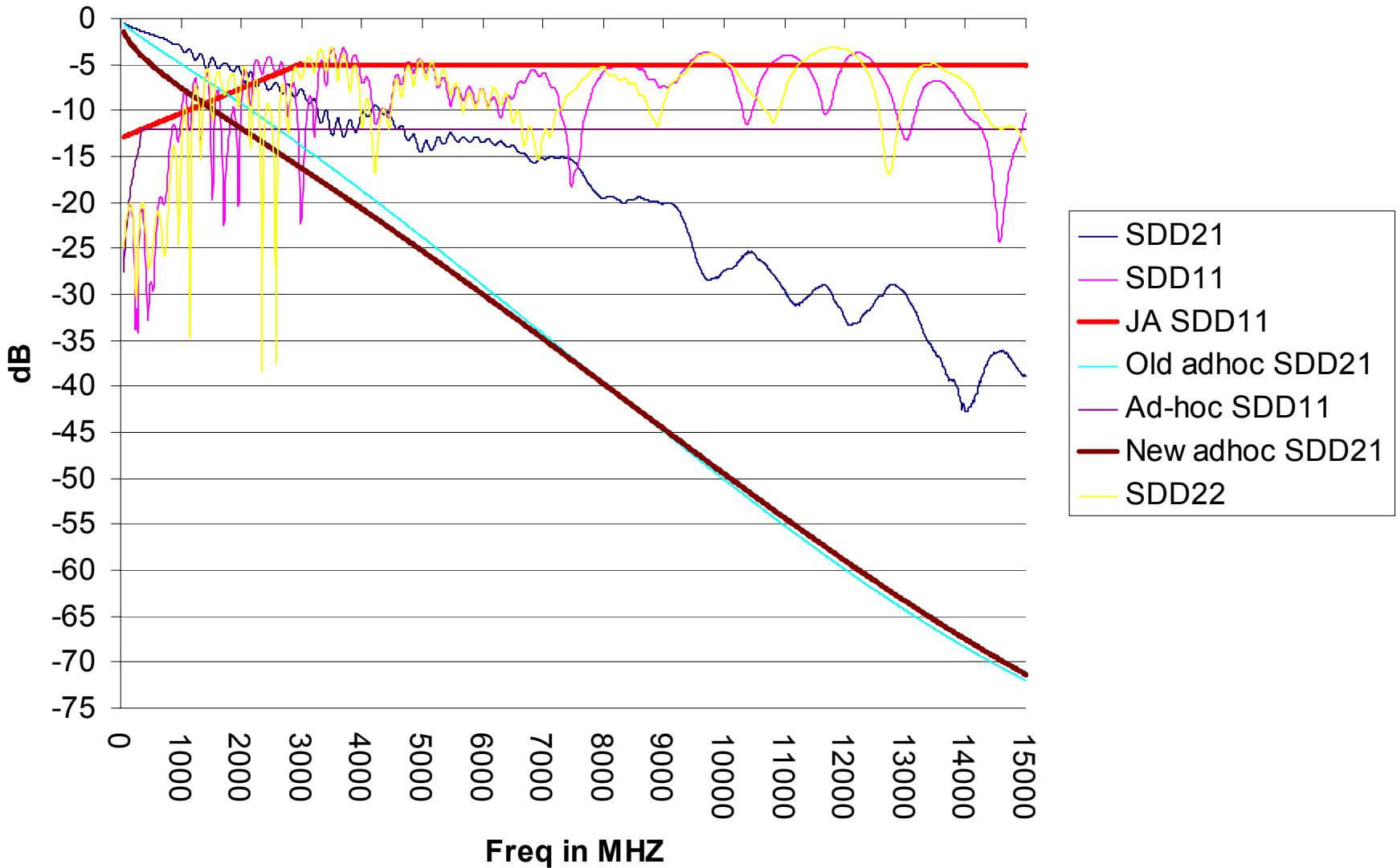
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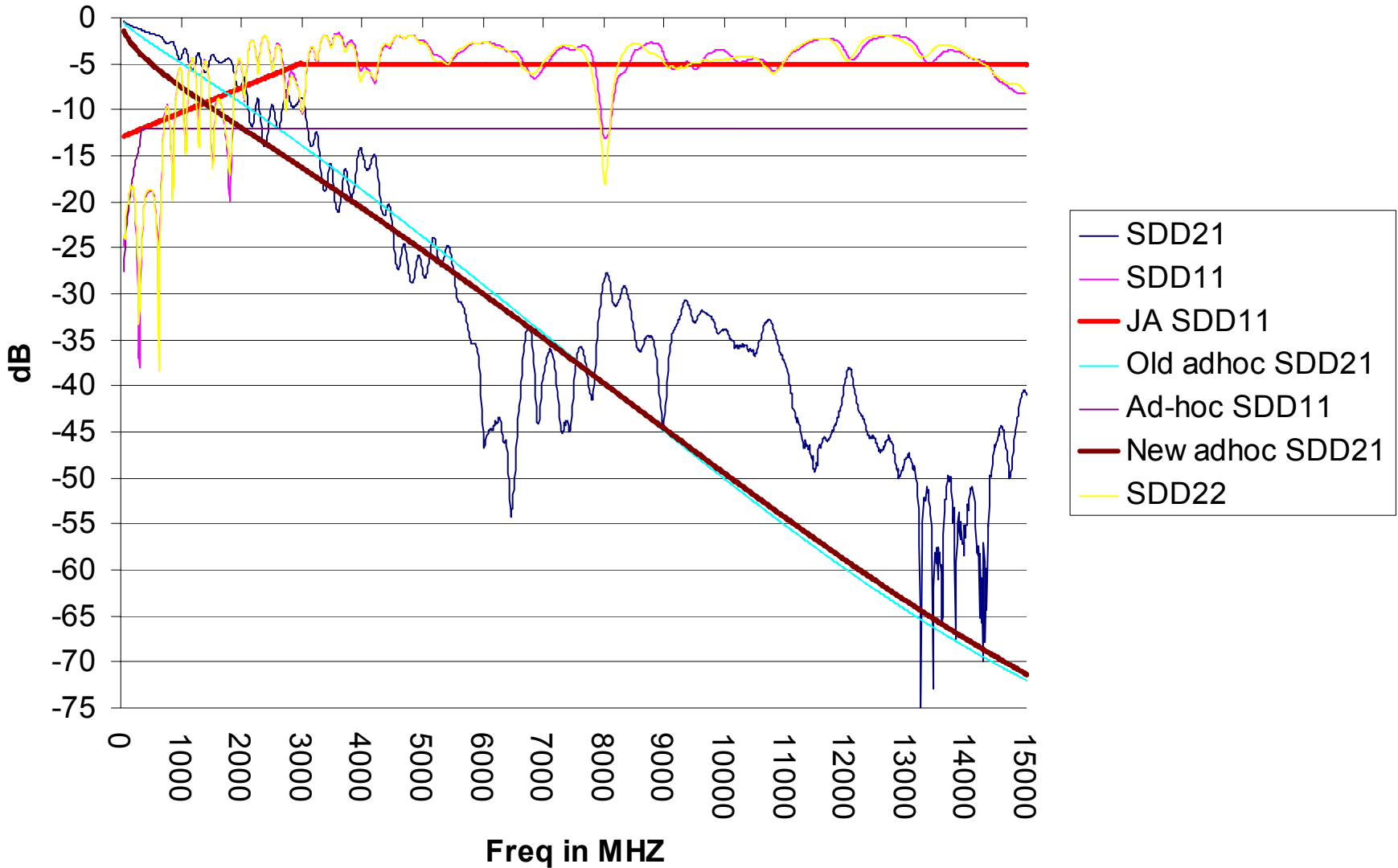
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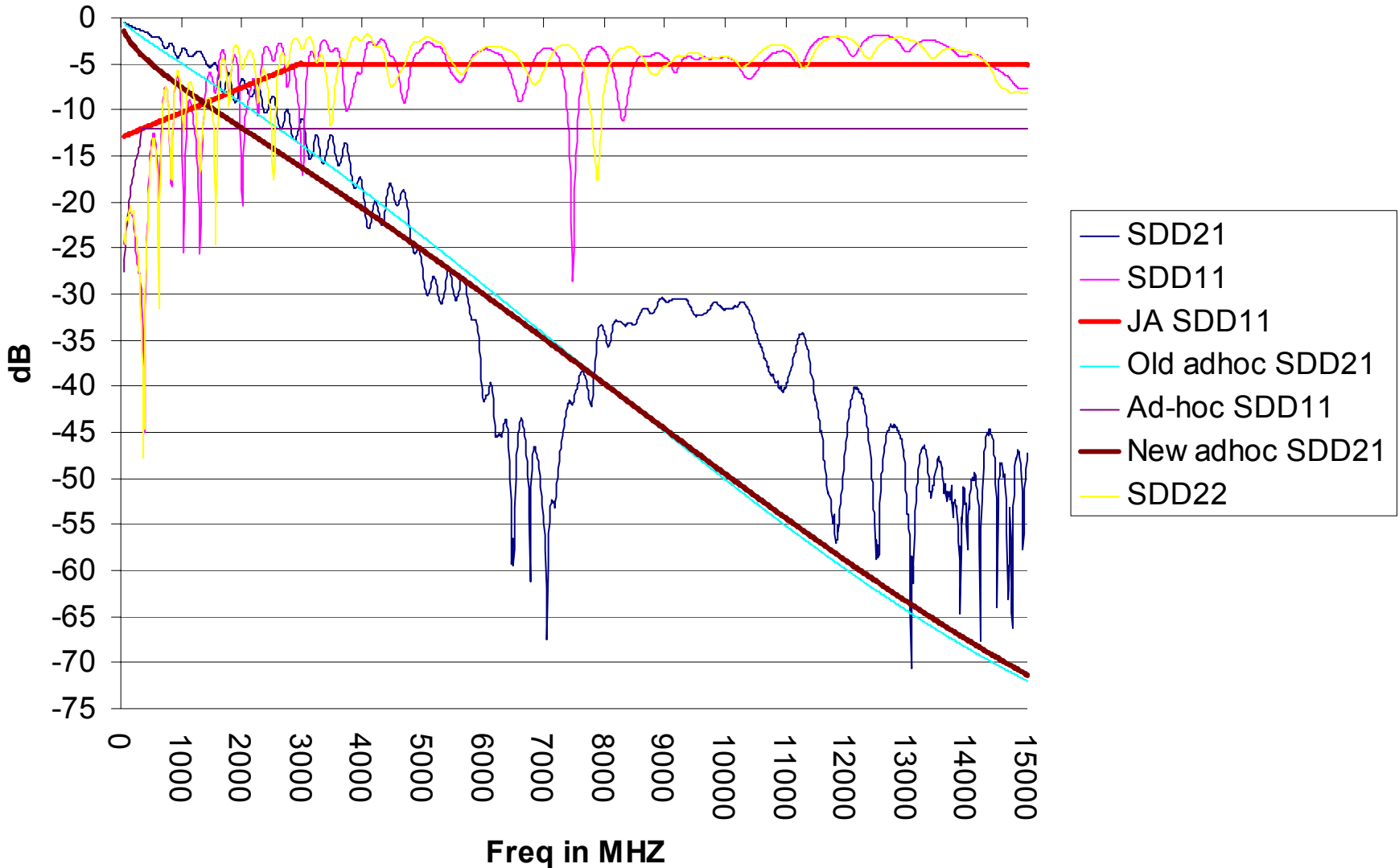
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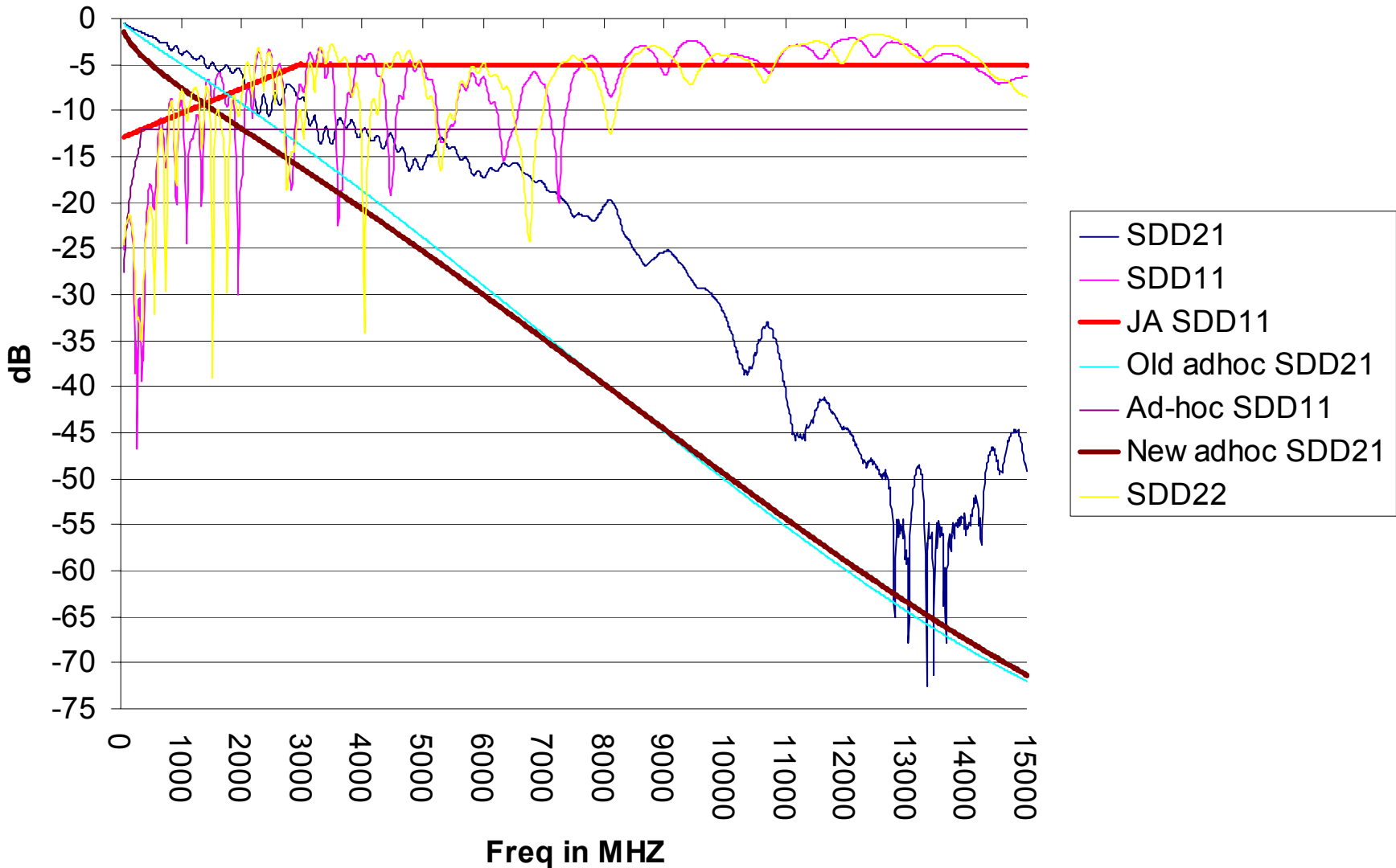
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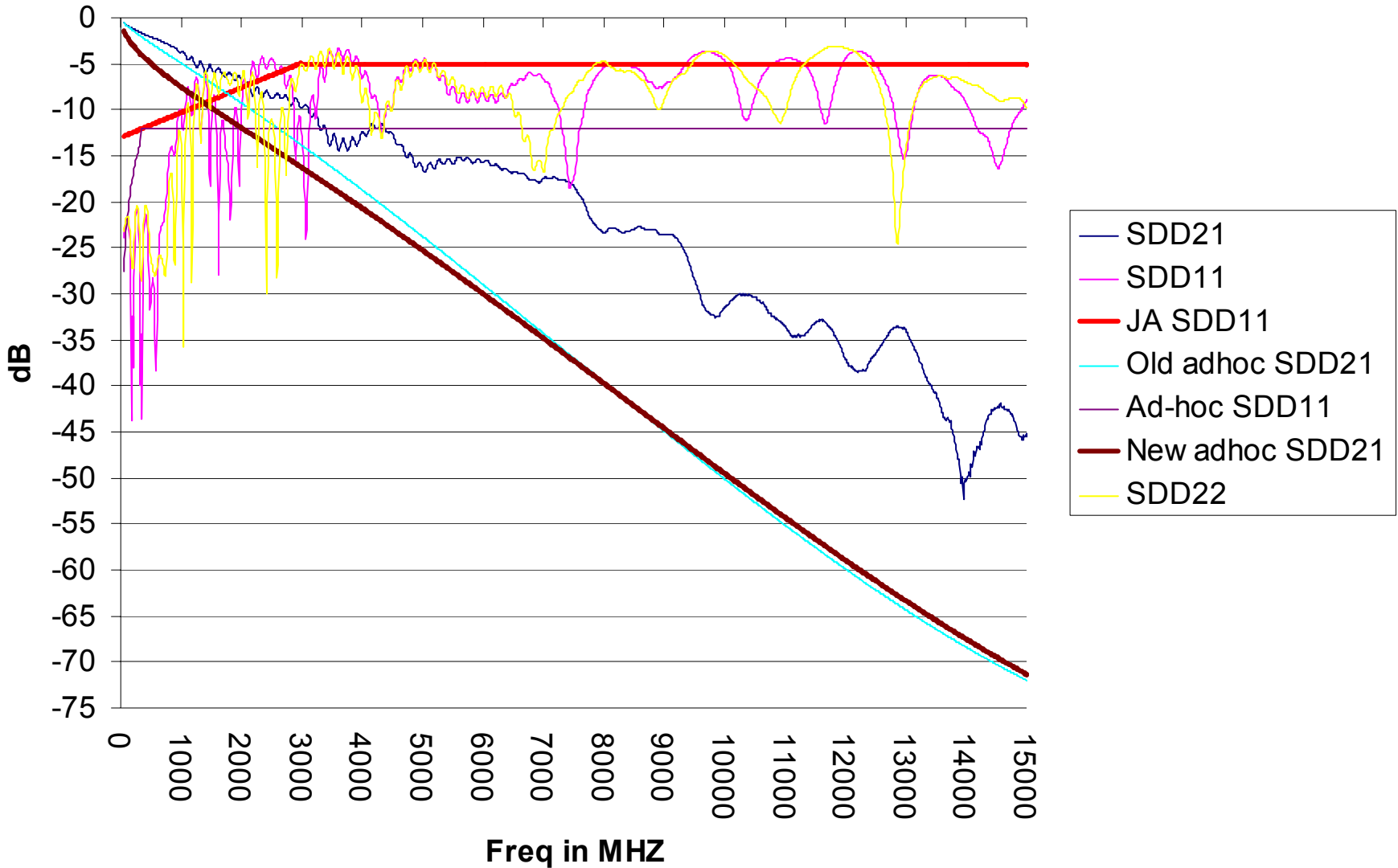
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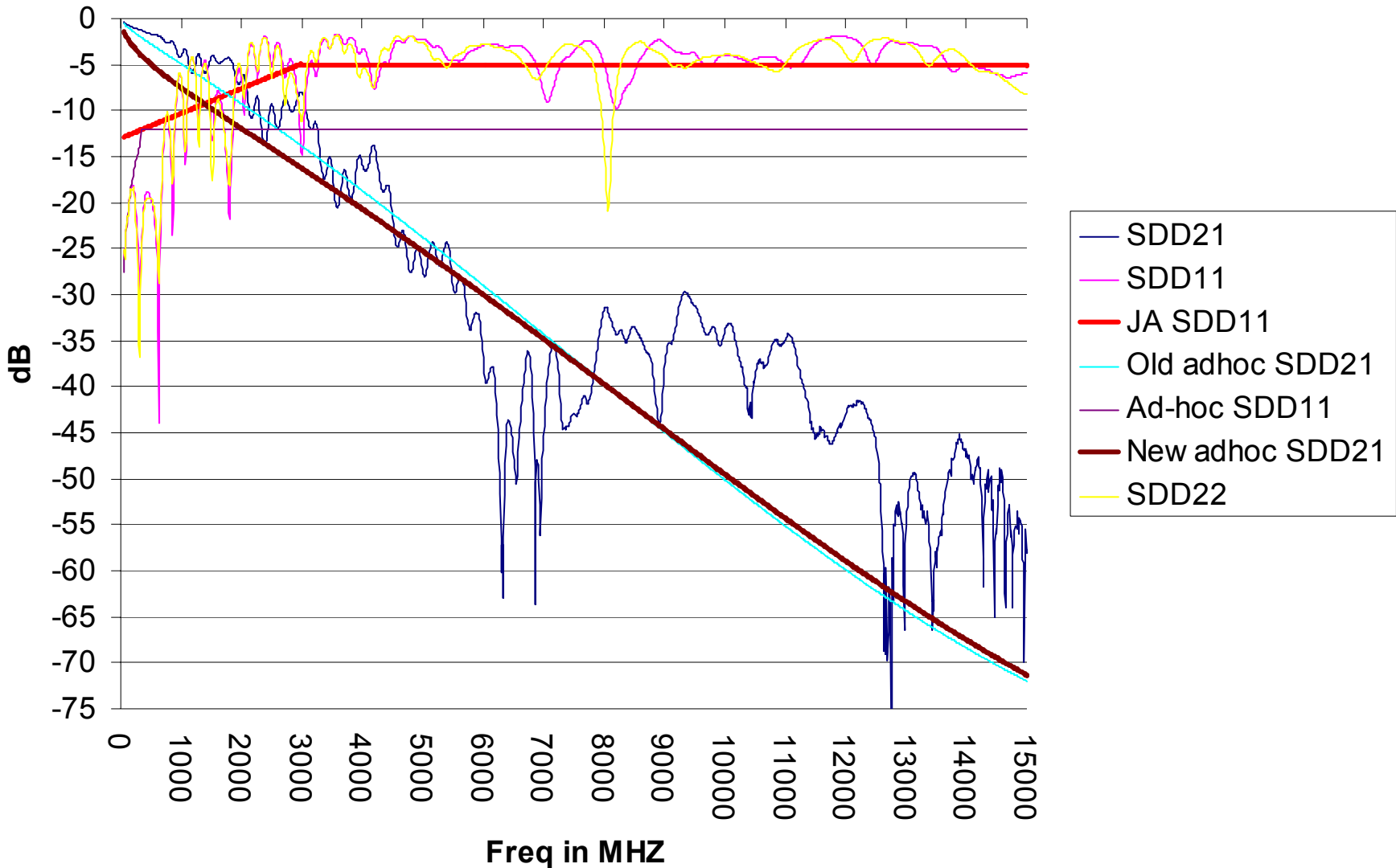
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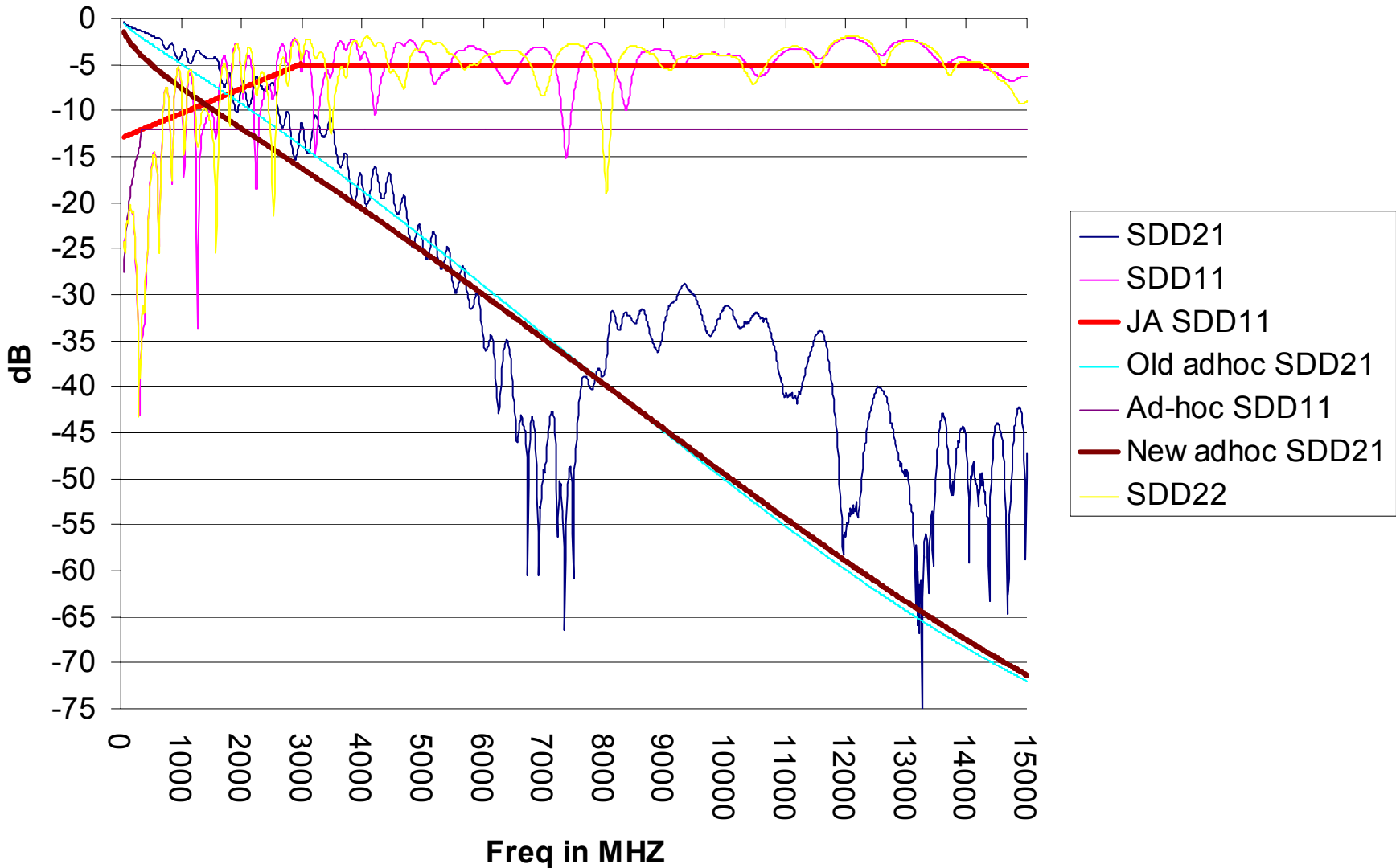
SDD21 SDD11 SDD22 CH17 AGGR0 N4000-13



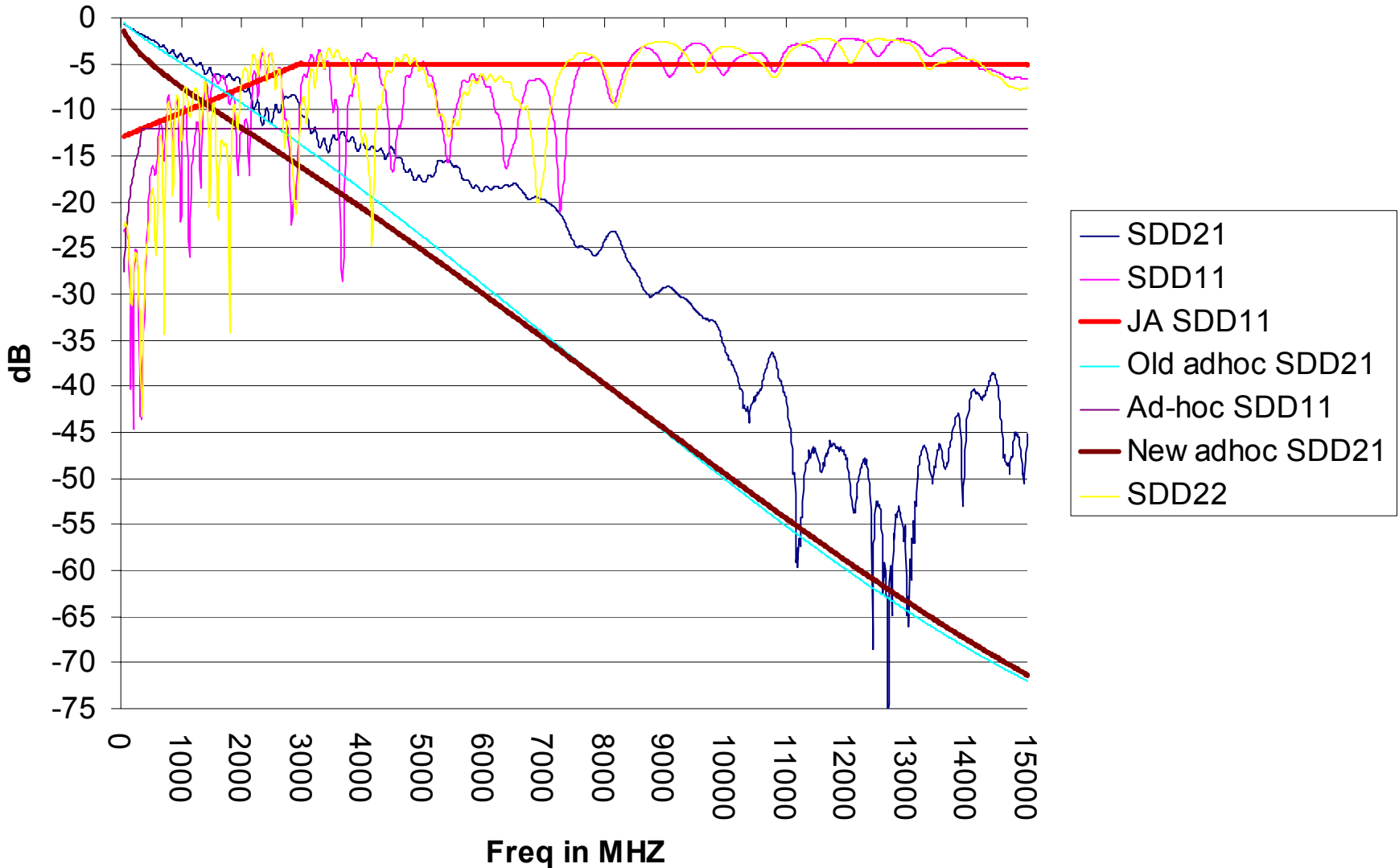
SDD21 SDD11 SDD22 CH17 AGGR1 N4000-13



SDD21 SDD11 SDD22 CH17 AGGR2 N4000-13

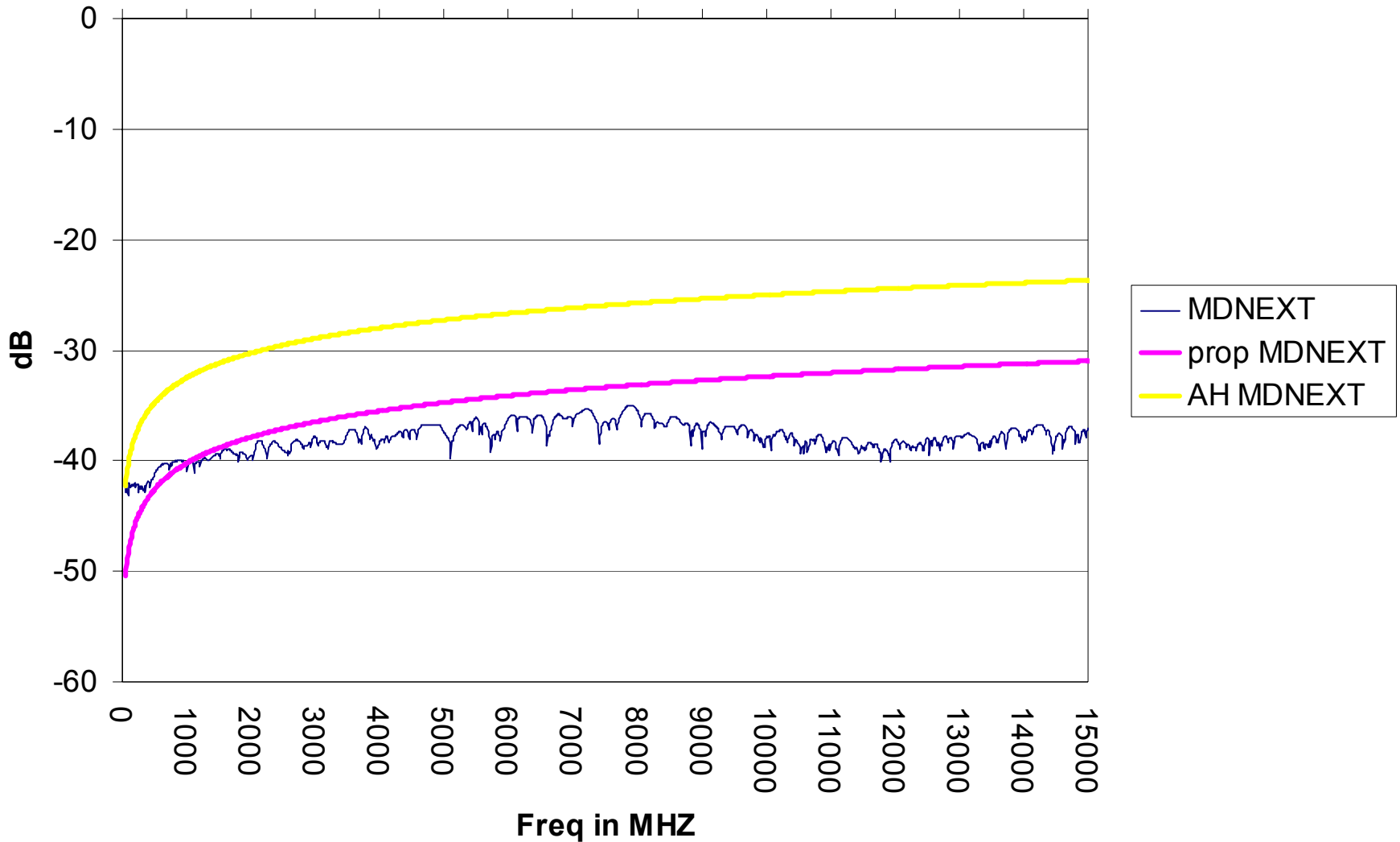


SDD21 SDD11 SDD22 CH17 AGGR3 N4000-13

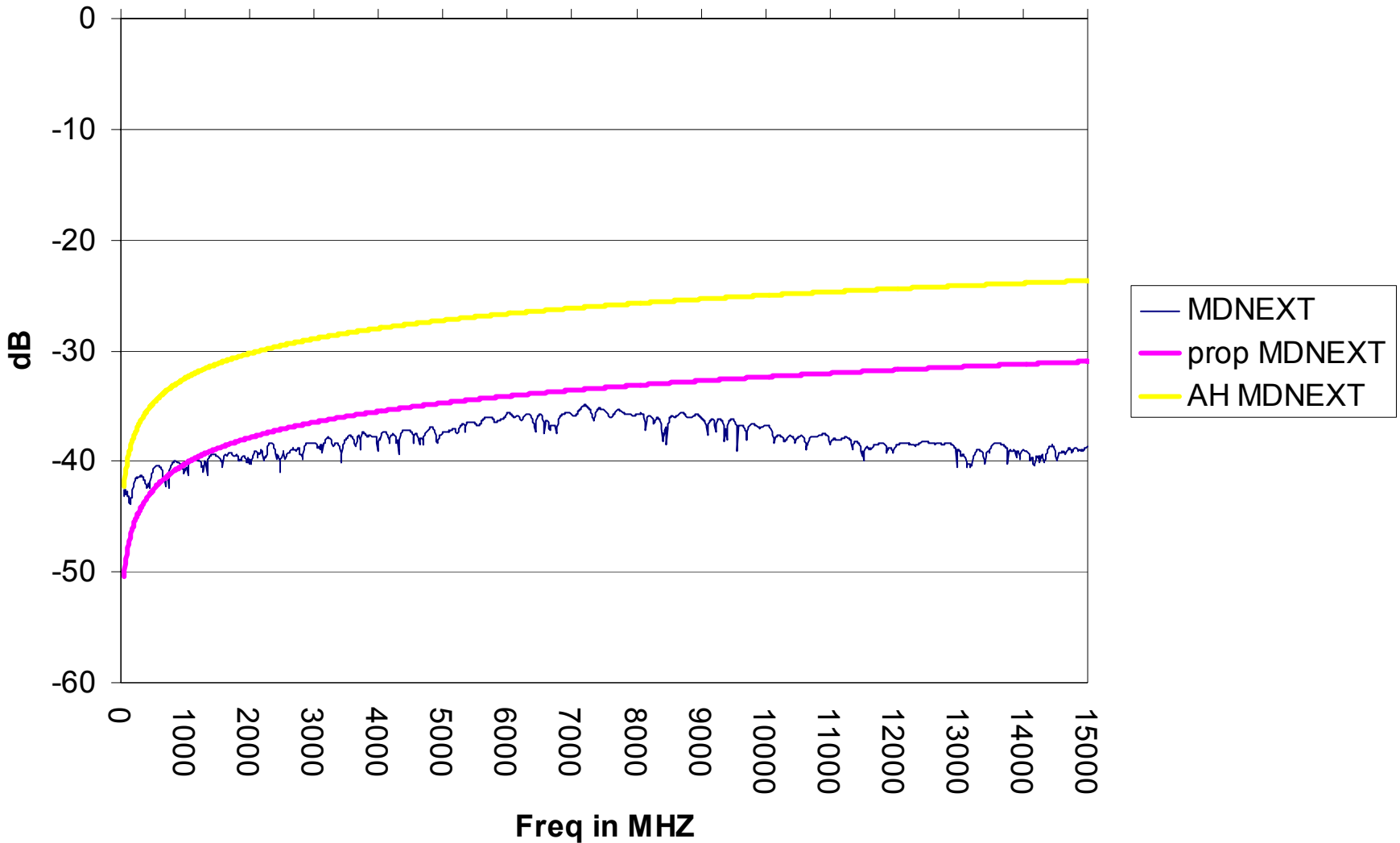


- The limit lines are multi-aggressor.
- Data shown is multi-aggressor.

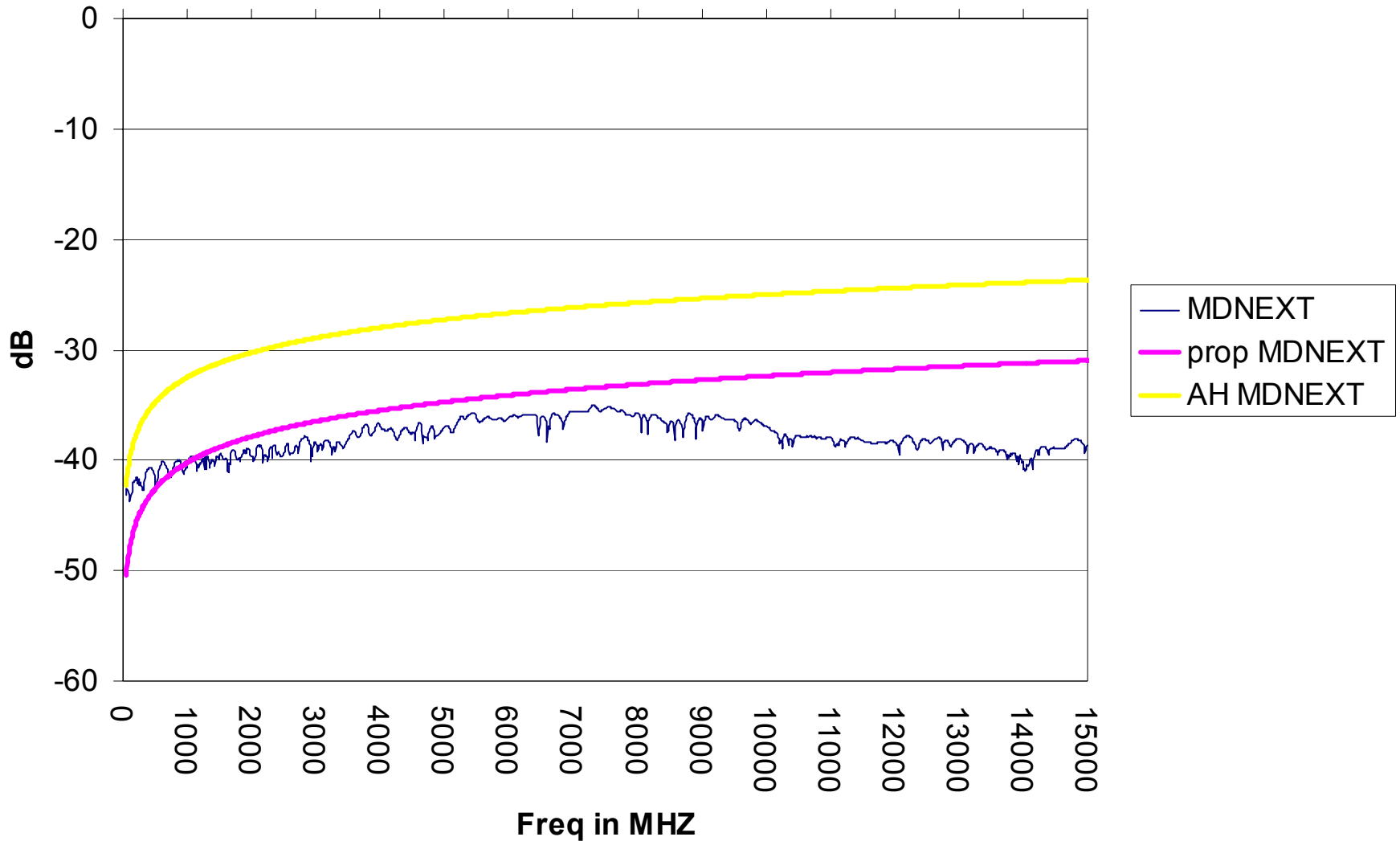
CH2 MDNEXT



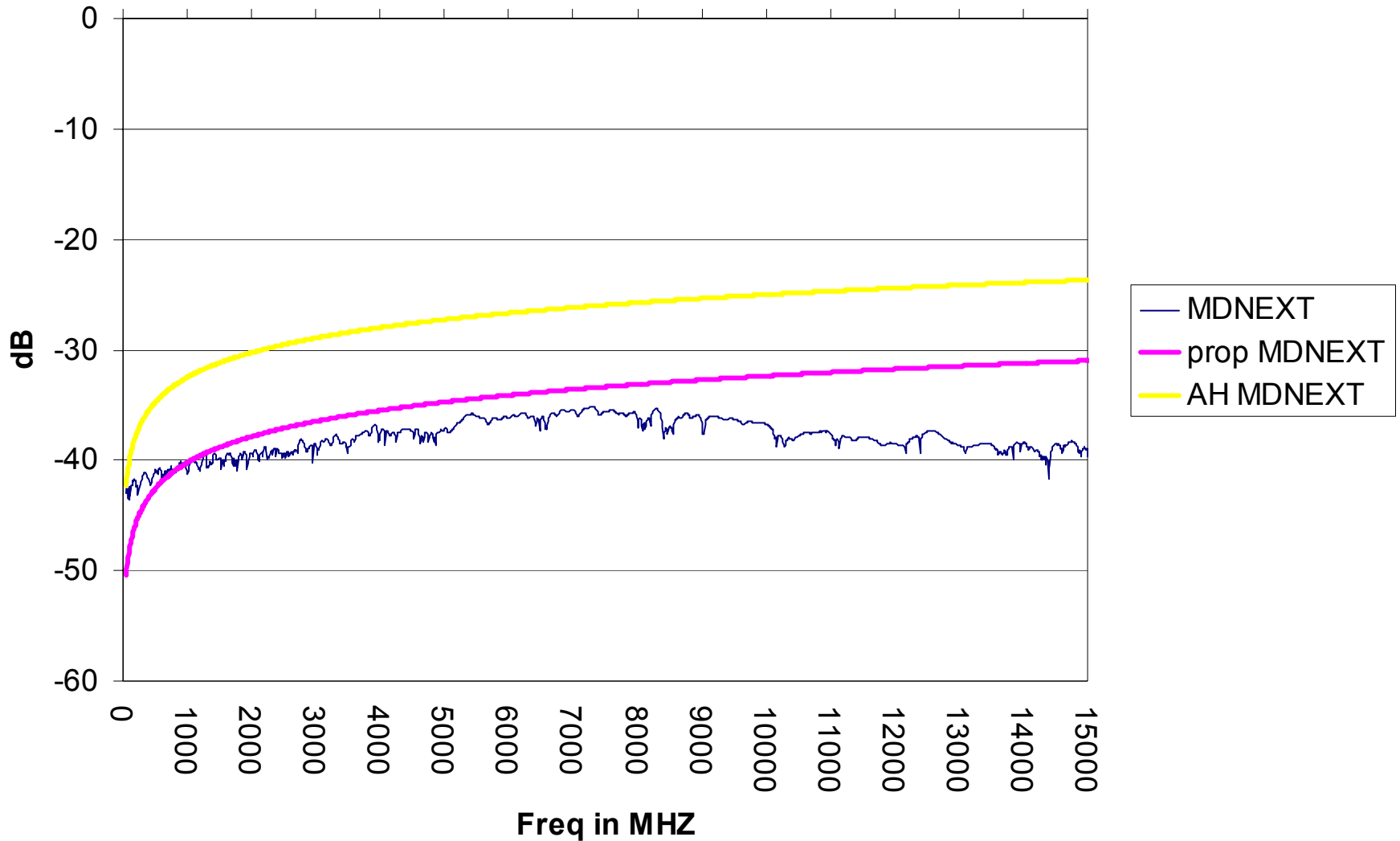
CH7 MDNEXT



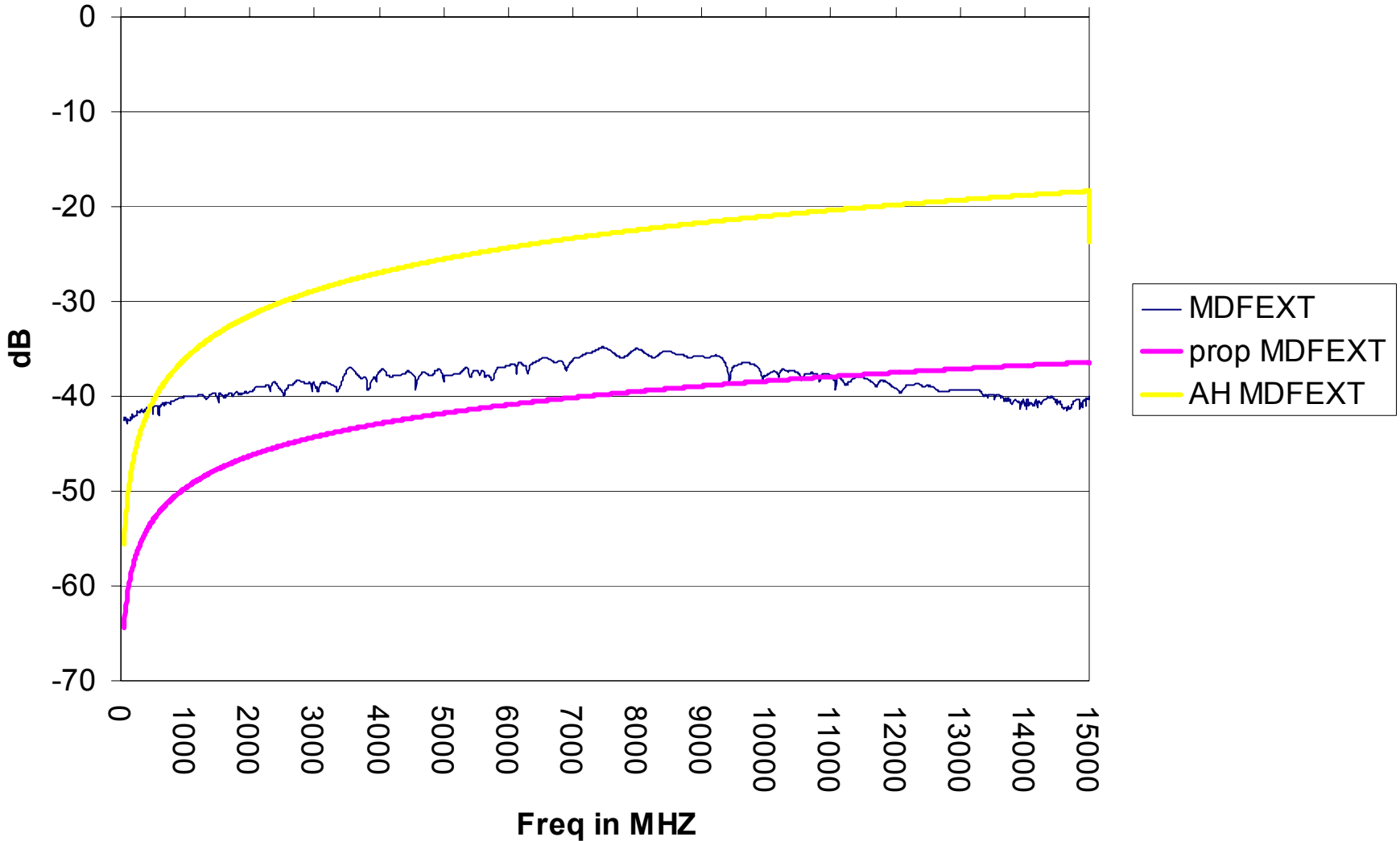
CH12 MDNEXT



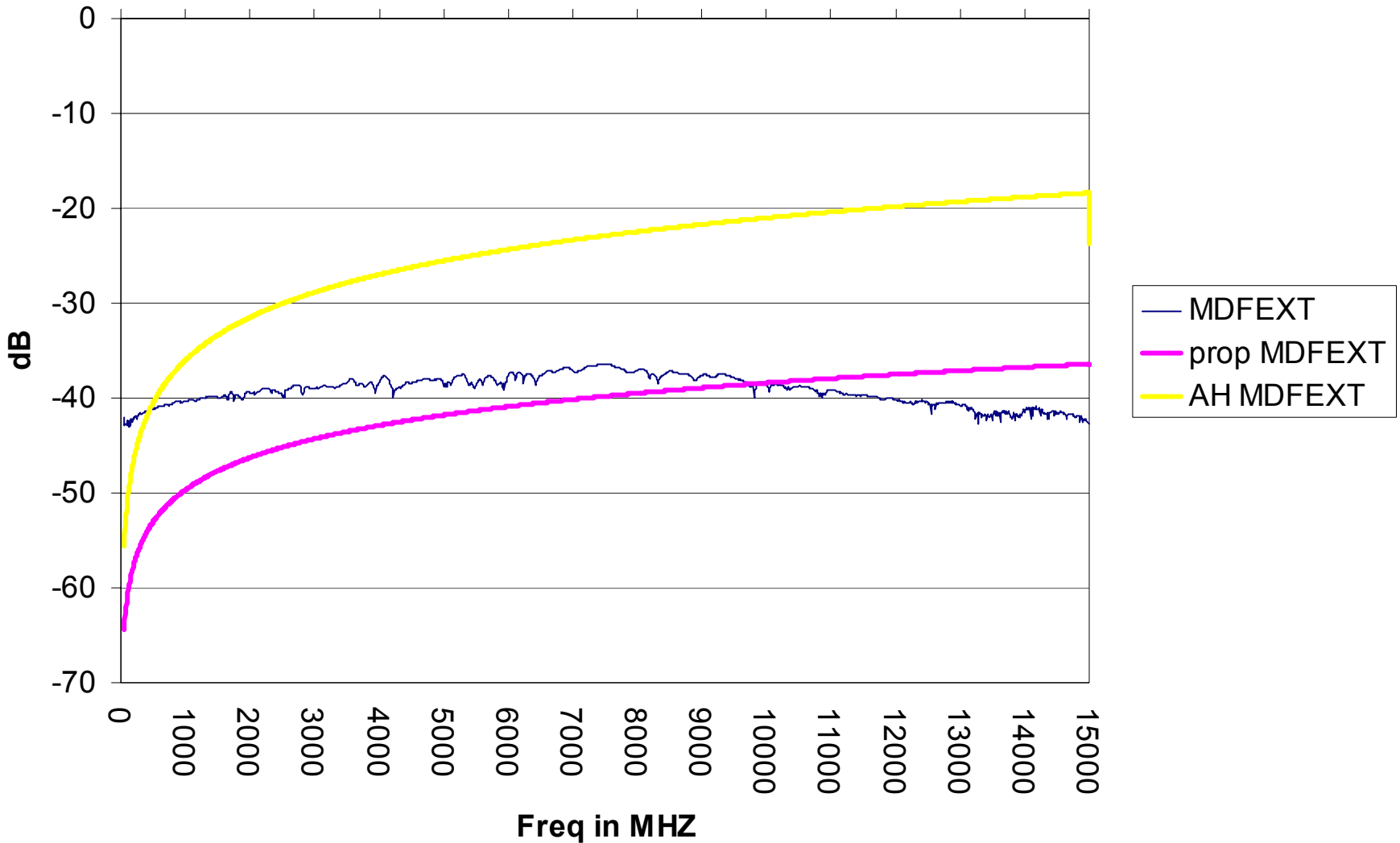
CH17 MDNEXT



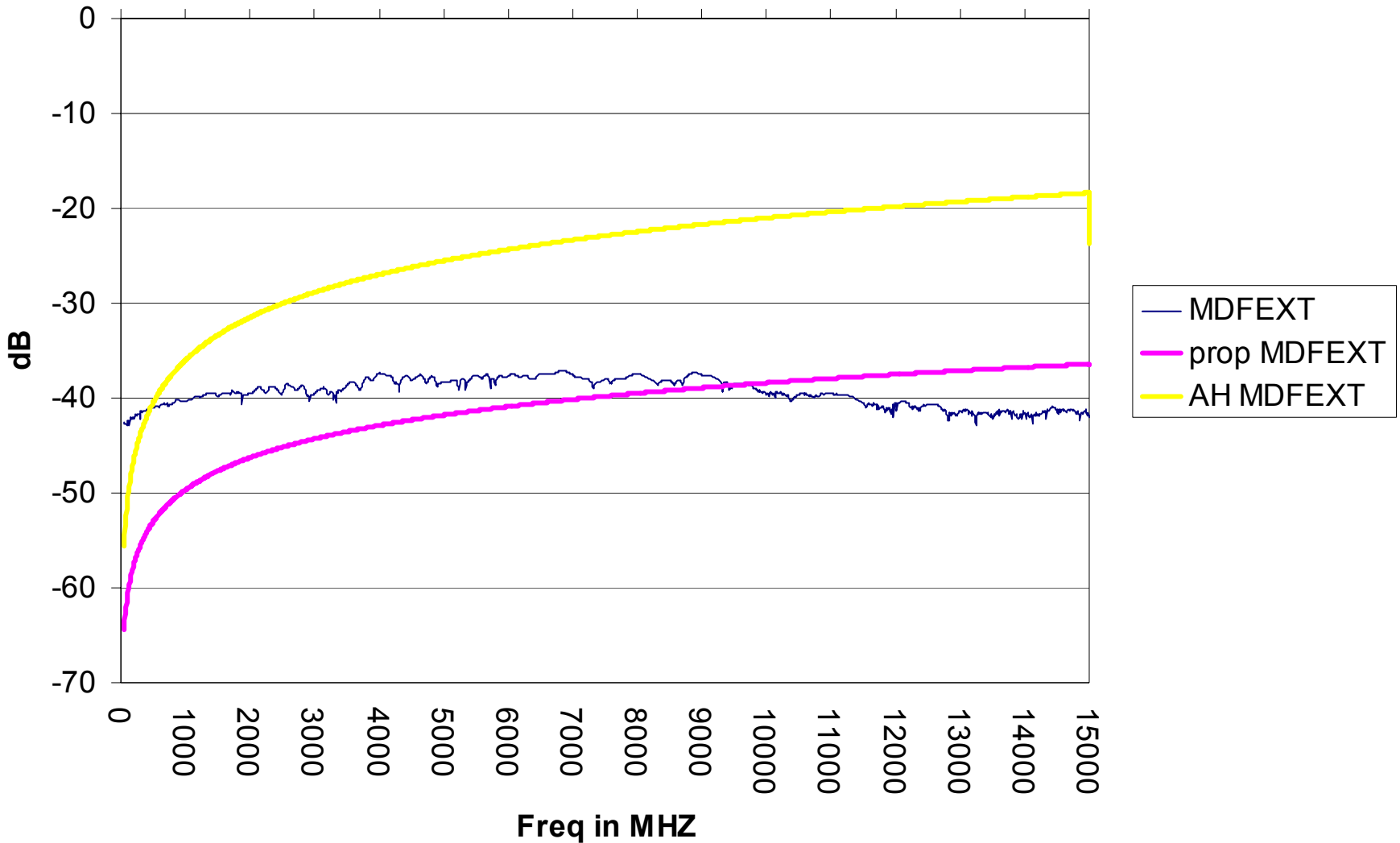
CH2 MDFEXT



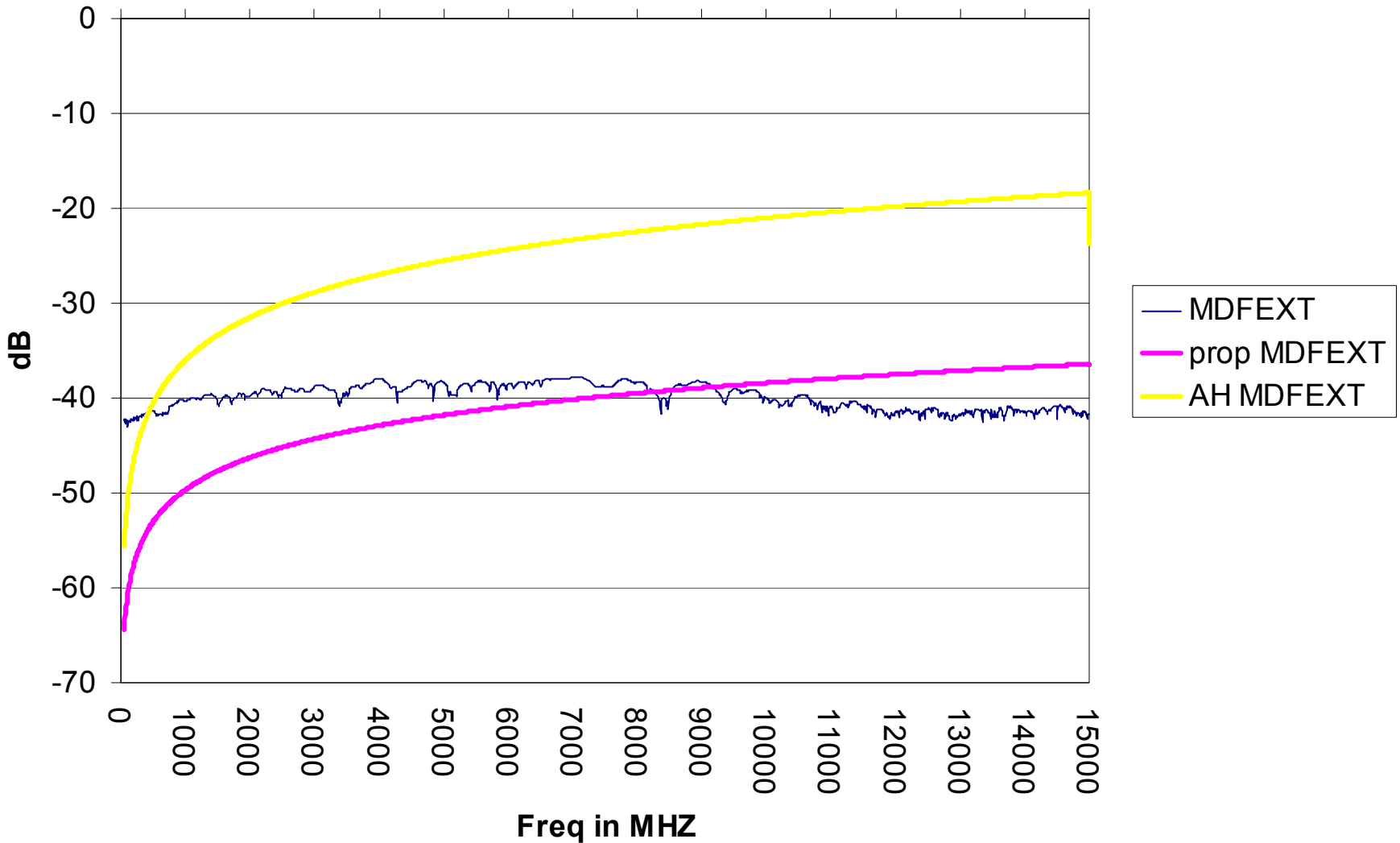
CH7 MDFEXT



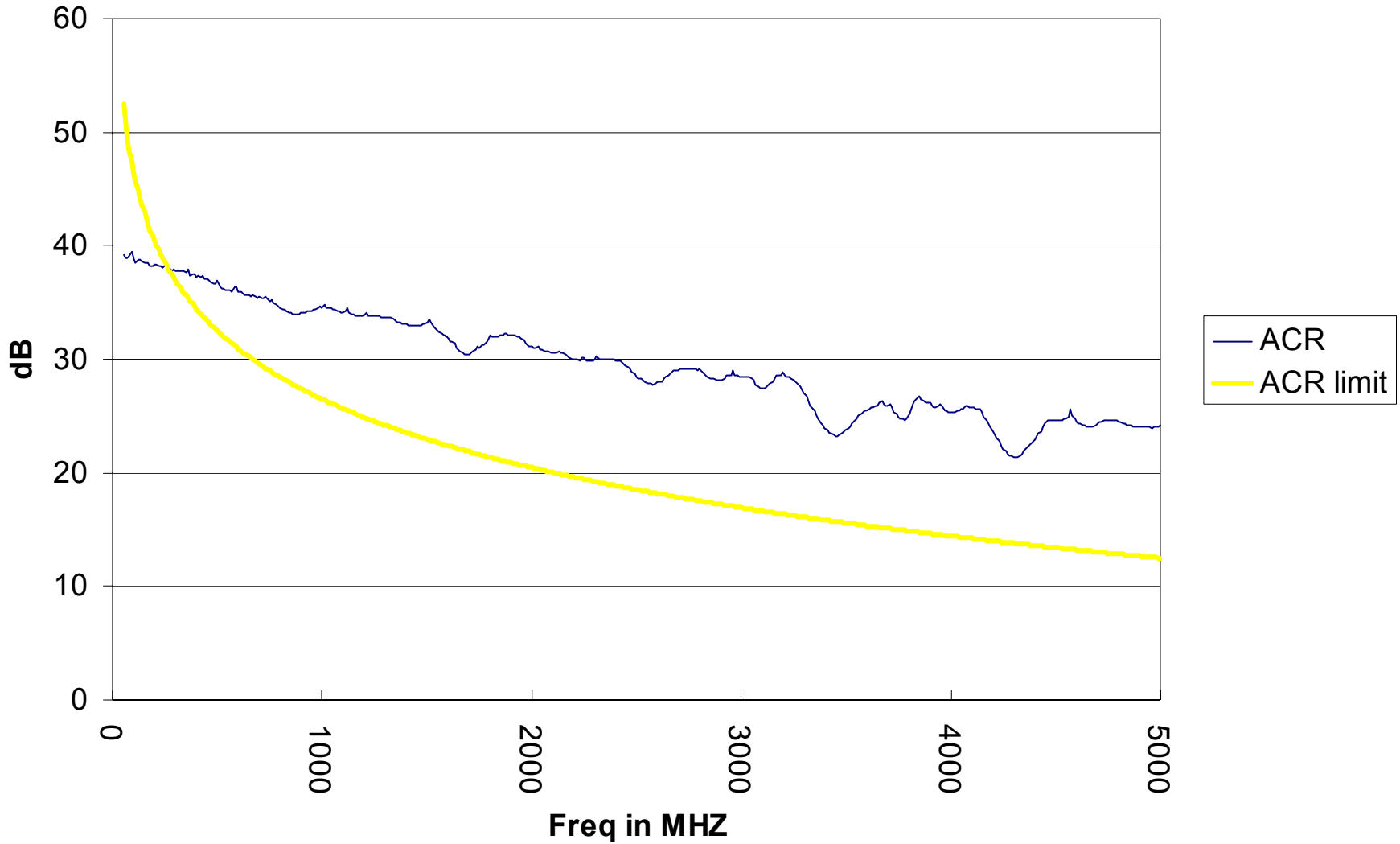
CH12 MDFEXT



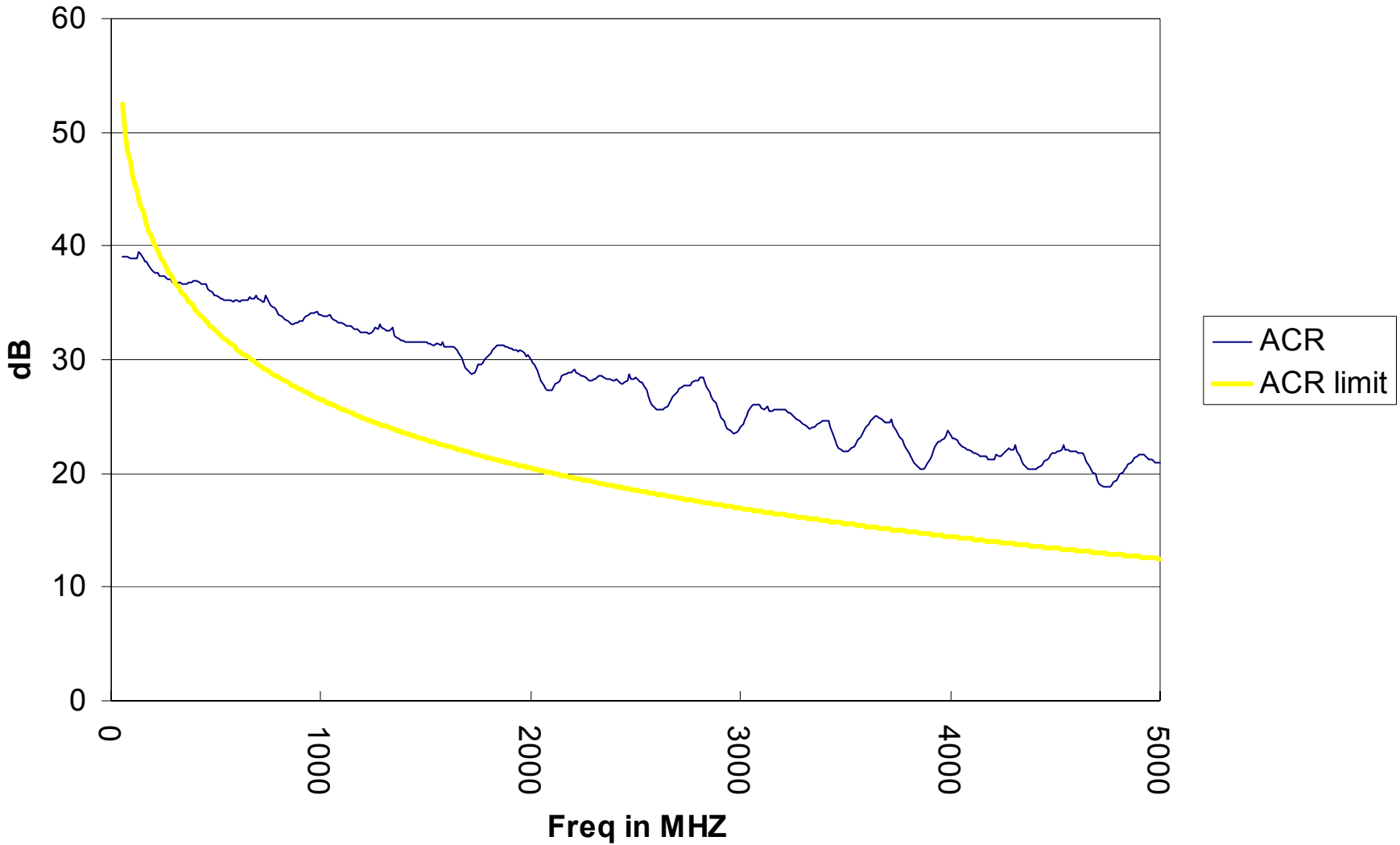
CH17 MDFEXT



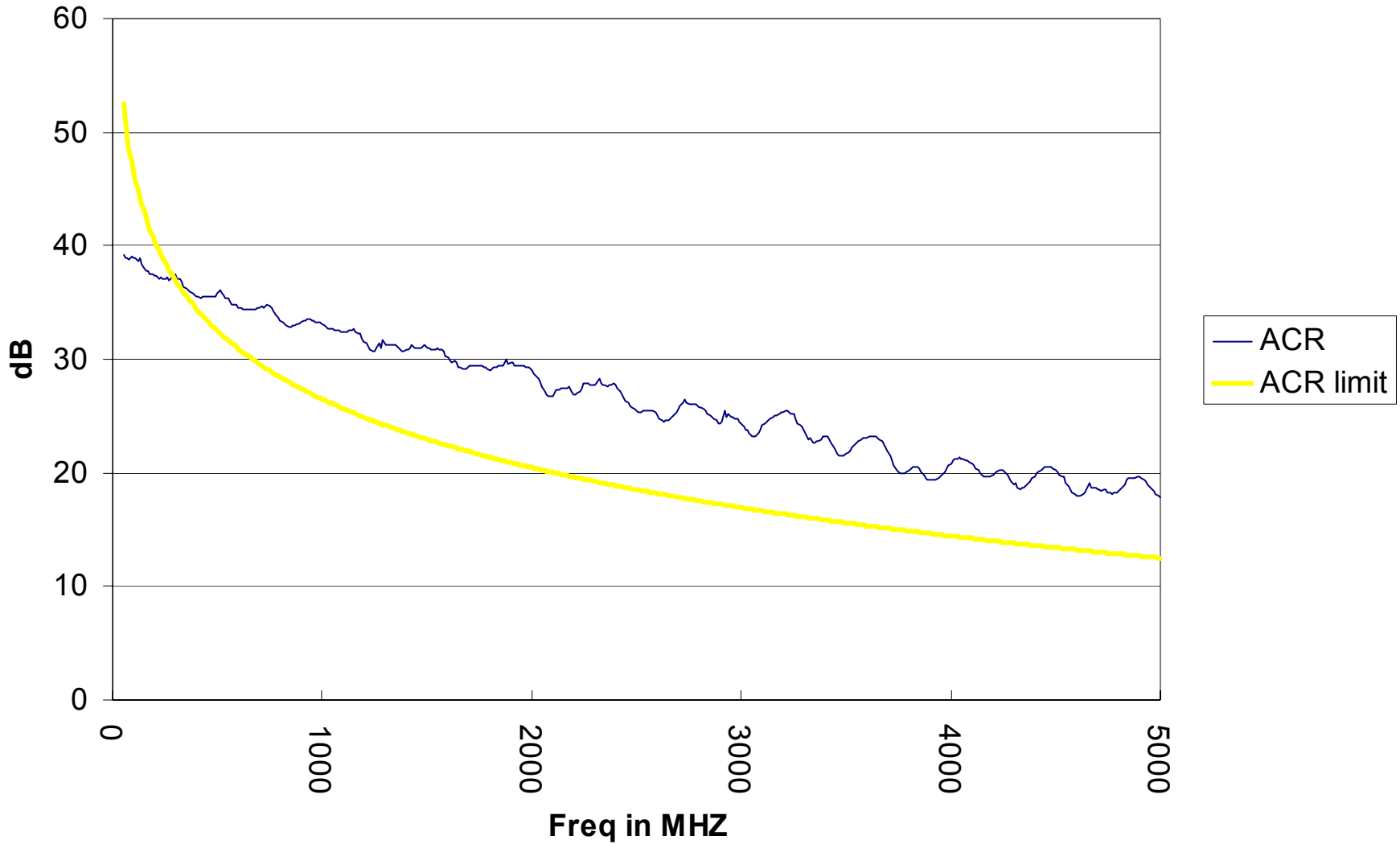
CH2 ACR



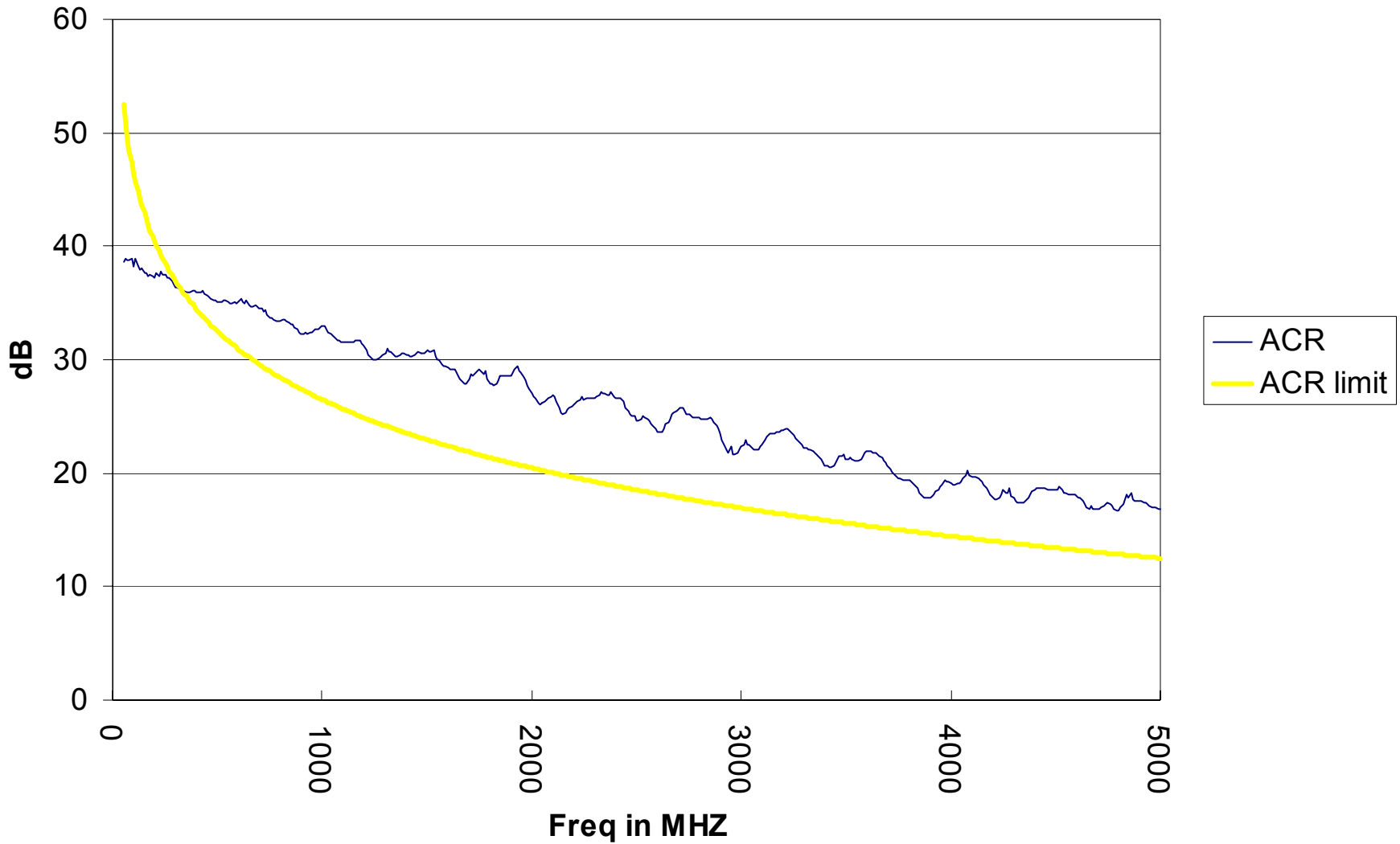
CH7 ACR



CH12 ACR



CH17 ACR



- Refine channel parameters.
- Refine SMA launch characteristics. Use data to model accurately informative TP5.
- Define SDD11/SDD22 at higher limit for shorter daughter card and back plane channels. Or dictate minimum trace length. Note that two or more short lengths in a row contribute to a higher SDD11.
- Define maximum stub length.