

Laboratório de Ensaios

RELATÓRIO DE ENSAIO 09012-V01-01-R01

CABO UTP CAT. 5E – 4PARES – CONDUTOR MULTIFILAR – PAR TRANÇADO DE 100 OHMS

HISTÓRICO DAS REVISÕES

Revisão	Motivo	Período	Autor	Data
01	Emissão Inicial	18/02/09 a 27/02/09	jpgongora	27/02/09

APROVAÇÃO

**FITec – Responsável
Técnico**

Gabriel Quinteiro

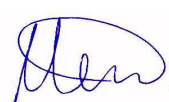


Data

27/02/09

Autor(es)

José Henrique D. Gongora



Data

27/02/09

ÍNDICE

1. OBJETIVO	3
2. INFORMAÇÕES GERAIS	3
2.1. DADOS DO FABRICANTE.....	3
2.2. DADOS DO SOLICITANTE	3
2.3. DADOS DO OCD	3
2.4. LOCAL DOS TESTES.....	3
2.5. DADOS COMERCIAIS.....	3
3. DADOS DA AMOSTRA.....	4
3.1. DESCRIÇÃO.....	4
3.2. IDENTIFICAÇÃO.....	4
3.3. FOTOS.....	4
4. CONDIÇÕES AMBIENTAIS	5
5. INSTRUMENTOS UTILIZADOS.....	5
6. SW UTILIZADOS.....	5
7. ENSAIOS REALIZADOS.....	6
7.1. OUTRAS INFORMAÇÕES	13
8. DOCUMENTOS ASSOCIADOS.....	13
8.1. DOCUMENTOS DE REFERÊNCIA.....	13
9. LISTA DE COLABORADORES	14
10. ANEXOS	14

TABELAS

Tabela 1 – Identificação das Amostras	4
Tabela 2 – Temperatura (°C).....	5
Tabela 3 – Instrumentos Utilizados	5
Tabela 4 – Produtos/Ferramentas SW Utilizados	5
Tabela 5 – Ensaio Realizados.....	6
Tabela 6 – Lista de colaboradores	14

1. OBJETIVO

Apresentar os resultados dos ensaios, realizados no Cabo UTP – sem blindagem – cat. 5e – para uso interno – par trançado de 100 ohms (capacidade de 4pares) – Condutor Multifilar, de fabricação Microcenter Teleinformática Com. e Represent. Ltda, segundo o documento normativo ANSI TIA/EIA-568-B.2 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling Components, ABNT NBR – 14703:2005 - Cabos de Telemática de 100 Ohms para Redes Internas Estruturadas e Requisitos Técnicos de Categoria I do sítio da Anatel na internet.

2. INFORMAÇÕES GERAIS

2.1. Dados do Fabricante

Nome do Fabricante: Microcenter Teleinformática Comercio e Representações Ltda
Endereço: Av. Anapólis, 490 – Bethaville – Barueri – S.P.
CEP: 06404-250
Contato: Eduardo Corigliano
Telefone: +55 11 5606.8000

2.2. Dados do Solicitante

Nome do Solicitante: UL do Brasil Certificações.
Endereço: Rua Fidêncio Ramos, 195 – 2º andar – Vila Olímpia - São Paulo – S.P
CEP: 04551.010
Contato: João Abel
Telefone: +55 11 3049-8791

2.3. Dados do OCD

Nome do OCD: UL do Brasil Certificações
Endereço: Rua Fidêncio Ramos, 195 – 2º andar – Vila Olímpia - São Paulo – S.P
CEP: 04551.010
Contato: João Abel
Telefone: +55 11 3049-8791

2.4. Local dos Testes

Nome do Laboratório: Laboratório de Ensaios de Certificação - FITLAB
Fundação para Inovações Tecnológicas - FITec
Contato: Douglas Roberto Vicente
Telefone: +55 19 2137-6853

2.5. Dados Comerciais

Número do Contrato: LPC 09011-01

3. DADOS DA AMOSTRA

3.1. Descrição

Cabo UTP – sem blindagem – cat. 5e – para uso interno – par trançado de 100 ohms (capacidade de 4pares) – Condutor Multifilar.

3.2. Identificação

Tabela 1 – Identificação das Amostras

Informações das Amostras	Amostra 1
Código da Amostra	AMO-09012-V01
Modelo	UTP CAT 5e Condutor Multifilar 4 pares
Número de Série	Não se aplica
Versão SW	Não se aplica
Data do Recebimento	12/02//2009
Outras Informações	Gravação no cabo: MAXI UTP CAT.5E ISSO/IEC 11801 & EN 50288 & TIA/EIA-568-B.2 3P VERIFIED FOR GIGABIT ETHERNET 24AWGX4P TYPE CM (UL) E164469-F5 019615M

3.3. Fotos



Foto 1: 09012-V01-01-R01_GRAVAÇÃO

4. CONDIÇÕES AMBIENTAIS

Tabela 2 – Temperatura (°C)

Temperatura Mínima	20,6
Temperatura Máxima	22,9

5. INSTRUMENTOS UTILIZADOS

Tabela 3 – Instrumentos Utilizados

Nome do Instrumento	Nº de série	Validade da Calibração
Network Analyzer E0562A	MY44100267	02/10
Medidor RLC 4284A	2940J09793	11/09
Hipot HD100	Não se aplica	02/09
Multímetro Digital Fluke 45	4975217	03/09
Mini data logger 175-H2	20026553/402	06/10
Medidor de Alta Resistência HP4339B	JP1KD01280	01/11
Termômetro 54II	75980097	07/10
Micrômetro 103-104	Não se aplica	07/09
Espessímetro Mitutoyo	Não se aplica	12/10
Trena Stanley	Não se aplica	03/09
Máquina de tração universal	5404	07/09
Estufa Kotterman	Não se aplica	Não se aplica

6. SW UTILIZADOS

Tabela 4 – Produtos/Ferramentas SW Utilizados

Código do Item SW	Nome do SW	Versão	Fornecedor
SW01	A1 – LAN	V1.0 R23.01.2006	Josaphat Engenharia

7. ENSAIOS REALIZADOS

Tabela 5 – Ensaios Realizados

Documento Normativo: ANSI TIA/EIA-568-B.2 2001 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling Components										
Instrução de Testes: ITT-06001-02-CABOS_LAN-UTP-STP-CAT-3-5e-6										
Item da Norma	Ensaio	Método	Requisito	Resultado Obtido						
4.3.3.1	Diâmetro do condutor isolado	NBR NM-IEC 60811-1-1 : 2001	O Diâmetro do Condutor Isolado deve ser, no máximo, 1,22 mm	Máximo valor obtido 0,955 mm						
4.3.3.5	Resistência à tração de ruptura do cabo	ASTM-D-4565	O valor de pico da Resistência à Tração de Ruptura do cabo, medido de acordo com a ASTM D4565, deve ser, no mínimo, 400 N.	515,8 N						
4.3.3.6	Raio de dobramento (a frio)	ASTM-D-4565	O cabo UTP deve suportar o dobramento com um raio de 25,4 mm, à temperatura de -20°C ± 1°C, sem que haja trincas na blindagem, na capa ou no isolamento, quando ensaiado de acordo com a ASTM D4565.	A amostra suportou o dobramento com um raio de 25,4 mm, à temperatura de -20°C ± 1°C, sem que tenha sido cons tatadas trincas na capa e isolamento						
4.3.4.1	Resistência Elétrica dos condutores	ASTM D4566	A resistência (resistance) de cada condutor, medida de acordo com o documento de referência “ASTM D4566”, em corrente contínua, referida à 20°C, não deve exceder 9,38Ω por 100m.	<table><tr><th colspan="2">Resistência Elétrica Máxima (Ω/100m) à 20°C</th></tr><tr><th>Par / Veia</th><th>Valor obtido</th></tr><tr><td>1 / B</td><td>8,73</td></tr></table>	Resistência Elétrica Máxima (Ω/100m) à 20°C		Par / Veia	Valor obtido	1 / B	8,73
Resistência Elétrica Máxima (Ω/100m) à 20°C										
Par / Veia	Valor obtido									
1 / B	8,73									
4.3.4.2	Desequilíbrio Resistivo	ASTM D4566	O desequilíbrio resistivo (resistance unbalance) entre dois condutores de qualquer par, medido de acordo com o documento de referência “ASTM D4566”, em corrente contínua, referida à 20°C, não deve exceder 5%.	<table><tr><th colspan="2">DR Máximo Individual (%)</th></tr><tr><th>Par</th><th>Valor obtido</th></tr><tr><td>3</td><td>2,2</td></tr></table>	DR Máximo Individual (%)		Par	Valor obtido	3	2,2
DR Máximo Individual (%)										
Par	Valor obtido									
3	2,2									

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Documento Normativo: ANSI TIA/EIA-568-B.2 2001 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling Components								
Instrução de Testes: ITT-06001-02-CABOS_LAN-UTP-STP-CAT-3-5e-6								
Item da Norma	Ensaio	Método	Requisito	Resultado Obtido				
4.5.3	Perda de retorno	ASTM D4566	Para todas as frequências de 1MHz à 100MHz, a perda de retorno (return loss), para um comprimento de 100m, deve satisfazer os valores determinados utilizando as equações especificadas na tabela “16” do documento normativo TIA/EIA-568-B.2.	Pior caso				
				Par	Frequência (MHz)	Especificado (dB)	Perda de Retorno (dB)	
				4	1,4	20,7	22,9	
4.5.4	Atenuação	ASTM D4566	Para todas as frequências de 1MHz à 100MHz, a atenuação (insertion loss) deve satisfazer os valores determinados utilizando a equação “4” multiplicado por um fator de 1.2, do documento normativo TIA/EIA-568-B.2.	Pior Caso				
				Temp. (°C)	N.º do Par	Freq. (MHz)	Especificado (dB/100m)	Atenuação (dB/100m)
				20	1	12,1	8,5	8,3
				40	1	74,0	22,3	22,2
				60	1	73,8	22,3	22,2
4.3.4.8	NEXT	ASTM D4566	Para todas as frequências de 0,772MHz à 100MHz, a perda NEXT (Near-end crosstalk “NEXT” loss), para um comprimento de 100m ou maior, deve satisfazer os valores determinados utilizando a equação “6” do documento normativo TIA/EIA-568-B.2.	Pior caso				
				Par	Frequência (MHz)	Especificado (dB)	NEXT (dB)	
				1x2	69,7	37,6	43,6	

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Documento Normativo: ANSI TIA/EIA-568-B.2 2001 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling Components							
Instrução de Testes: ITT-06001-02-CABOS_LAN-UTP-STP-CAT-3-5e-6							
Item da Norma	Ensaio	Método	Requisito	Resultado Obtido			
4.3.4.9	PSNEXT	ASTM D4566	Para todas as frequências de 0,772MHz à 100MHz, a perda PSNEXT (power sum near-end crosstalk “PSNEXT” loss), para um comprimento de 100m ou maior, deve satisfazer os valores determinados utilizando a equação “8” do documento normativo TIA/EIA-568-B.2.	Pior caso			
				Par	Frequência (MHz)	Especificado (dB)	PSNEXT (dB)
				1	69,6	34,7	42,2
4.3.4.10	ELFEXT	ASTM D4566	Para todas as frequências de 1MHz à 100MHz, ELFEXT (equal level far-end crosstalk “ELFEXT”), para um comprimento de 100m, deve satisfazer os valores determinados utilizando a equação “9” do documento normativo TIA/EIA-568-B.2.	Pior caso			
				Par	Frequência (MHz)	Especificado (dB/100m)	ELFEXT (dB/100m)
				4x2	89,3	24,8	28,9
4.3.4.11	PSELFEXT	ASTM D4566	Para todas as frequências de 1MHz à 100MHz, PSELFEXT (power sum equal level far-end crosstalk “PSELFEXT”), para um comprimento de 100m, deve satisfazer os valores determinados utilizando a equação “11” do documento normativo TIA/EIA-568-B.2.	Pior caso			
				Par	Frequência (MHz)	Especificado (dB/100m)	PSELFEXT (dB/100m)
				3	94,0	21,3	27,4
4.3.4.12	Atraso de propagação	ASTM D4566	Para todas as frequências de 1MHz à 100MHz, o atraso de propagação (propagation delay) deve satisfazer os valores determinados utilizando a equação “12” do documento normativo TIA/EIA-568-B.2.	Pior caso			
				Par	Frequência (MHz)	Especificado (ns/100m)	Atraso de propagação (ns/100m)
				1	100,0	537,6	484,9

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Documento Normativo: ANSI TIA/EIA-568-B.2 2001 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling Components																								
Instrução de Testes: ITT-06001-02-CABOS_LAN-UTP-STP-CAT-3-5e-6																								
Item da Norma	Ensaio	Método	Requisito	Resultado Obtido																				
4.3.4.13	Diferença entre os atrasos de propagação	ASTM D4566	Para todas as frequências de 1MHz à 100MHz, a diferença entre os atrasos de propagação (propagation delay skew),, para um comprimento mínimo de 100m, não deve exceder 45ns/100m para as temperaturas de 20°C, 40°C e 60°C. A diferença entre os atrasos de propagação entre todos os pares também não deve variar mais que ±10ns da medida em 20°C quando medida à 40°C e 60°C.	<table><tr><th colspan="4">Pior Caso</th></tr><tr><th>Temp. (°C)</th><th>Freq. (MHz)</th><th>Especificado à 20°C (ns/100m)</th><th>Diferença entre os Atrasos de Propagação à 20°C (ns/100m)</th></tr><tr><td>20</td><td>100,0</td><td>45</td><td>22,2</td></tr><tr><td>40</td><td>91,7</td><td>45</td><td>20,9</td></tr><tr><td>60</td><td>91,9</td><td>45</td><td>21,9</td></tr></table>	Pior Caso				Temp. (°C)	Freq. (MHz)	Especificado à 20°C (ns/100m)	Diferença entre os Atrasos de Propagação à 20°C (ns/100m)	20	100,0	45	22,2	40	91,7	45	20,9	60	91,9	45	21,9
				Pior Caso																				
				Temp. (°C)	Freq. (MHz)	Especificado à 20°C (ns/100m)	Diferença entre os Atrasos de Propagação à 20°C (ns/100m)																	
				20	100,0	45	22,2																	
				40	91,7	45	20,9																	
				60	91,9	45	21,9																	
				<u>VARIAÇÃO ENTRE AS DIFERENÇAS DOS ATRASOS DE PROPAGAÇÃO</u>																				
				<table><tr><th colspan="4">Pior Caso</th></tr><tr><th>Temp. (°C)</th><th>Freq. (MHz)</th><th>Especificado (ns)</th><th>Variação da Diferença entre os Atrasos de Propagação (ns)</th></tr><tr><td>20 – 40</td><td>93,3</td><td>10,0</td><td>8,1</td></tr><tr><td>20 – 60</td><td>92,9</td><td>10,0</td><td>8,9</td></tr></table>	Pior Caso				Temp. (°C)	Freq. (MHz)	Especificado (ns)	Variação da Diferença entre os Atrasos de Propagação (ns)	20 – 40	93,3	10,0	8,1	20 – 60	92,9	10,0	8,9				
				Pior Caso																				
				Temp. (°C)	Freq. (MHz)	Especificado (ns)	Variação da Diferença entre os Atrasos de Propagação (ns)																	
20 – 40	93,3	10,0	8,1																					
20 – 60	92,9	10,0	8,9																					

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Documento Normativo: ANSI TIA/EIA-568-B.2 – 11 2005 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling Components – Addendum 11 – Specification of 4-Pair UTP and SCTP Cabling

Instrução de Testes: Não se aplica				
Item da Norma	Ensaio	Método	Requisito	Resultado Obtido
4.1	Diâmetro Externo do Cabo	NBR NM-IEC 60811-1-1 : 2001	O diâmetro do cabo completo deve ser menor que 9,0 mm	5,42 mm

Documento Normativo: ABNT NBR 14703:2005 - Cabos De Telemática De 100 Ohms Para Redes Internas Estruturadas

Instrução de Testes: ITT-06001-02-CABOS_LAN-UTP-STP-CAT-3-5e-6																																
Item da Norma	Ensaio	Método	Requisito				Resultado Obtido																									
4.5	Verificação	Visual	Os pares dos cabos de distribuição de 4 pares devem ser identificados, seqüencialmente, conforme as tabelas 4 ou 5 Tabela 4 da norma – Código de cores para cabos de 4 pares				<table><tr><th colspan="4">Identificação dos pares da amostra</th></tr><tr><th>NUMERO DO PAR</th><th>CONDUTOR “A”</th><th>CONDUTOR “B”</th><th>CÓDIGO DE CORES</th></tr><tr><td>1</td><td>Branca/azul</td><td>Azul</td><td>B/Az - Az</td></tr><tr><td>2</td><td>Branca/laranja</td><td>Laranja</td><td>B/L - L</td></tr><tr><td>3</td><td>Branca/ Verde</td><td>Verde</td><td>B/V - V</td></tr><tr><td>4</td><td>Branca/Marrom</td><td>Marrom</td><td>B/M - M</td></tr></table>		Identificação dos pares da amostra				NUMERO DO PAR	CONDUTOR “A”	CONDUTOR “B”	CÓDIGO DE CORES	1	Branca/azul	Azul	B/Az - Az	2	Branca/laranja	Laranja	B/L - L	3	Branca/ Verde	Verde	B/V - V	4	Branca/Marrom	Marrom	B/M - M
									Identificação dos pares da amostra																							
			NUMERO DO PAR	CONDUTOR “A”	CONDUTOR “B”	CÓDIGO DE CORES																										
			1	Branca/azul	Azul	B/Az - Az																										
			2	Branca/laranja	Laranja	B/L - L																										
			3	Branca/ Verde	Verde	B/V - V																										
			4	Branca/Marrom	Marrom	B/M - M																										

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Documento Normativo: ABNT NBR 14703:2005 - Cabos De Telemática De 100 Ohms Para Redes Internas Estruturadas				
Instrução de Testes: ITT-06001-02-CABOS_LAN-UTP-STP-CAT-3-5e-6				
Item da Norma	Ensaio	Método	Requisito	Resultado Obtido
5.1.3	Tensão elétrica Aplicada	NBR 9146	O isolamento entre condutores deve suportar, sem ruptura, conforme a NBR 9146: a) um potencial à corrente contínua de 1,0 kV por 1 minuto; b) um potencial à corrente contínua de 2,5 kV por 2 segundos.	O isolamento dos condutores suportou, sem ruptura: a) um potencial à corrente contínua de 1,0 kV por 1 minuto; b) um potencial à corrente contínua de 2,5 kV por 2 segundos.
5.1.4	Resistência de Isolamento	NBR 9145	A resistência de isolamento de cada condutor deve ser de no mínimo 5.000 MOhms.km, conforme a NBR 9145.	A resistência de isolamento de cada condutor foi superior a 50.000 MOhms.km
5.2.1	Alongamento dos condutores	NBR 6810	O alongamento mínimo dos condutores à ruptura, medido conforme a NBR 6810, deve ser 8%.	Valor mínimo obtido: 16,7 %
5.2.2	Alongamento do isolamento do condutor	NBR 9141	O alongamento mínimo do isolamento do condutor à ruptura, medido conforme a ABNT NBR 9141, deve ser de 100%	Valor mínimo obtido: 506,7 %

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Documento Normativo: ABNT NBR 14703:2005 - Cabos De Telemática De 100 Ohms Para Redes Internas Estruturadas					
Instrução de Testes: ITT-06001-02-CABOS_LAN-UTP-STP-CAT-3-5e-6					
Item da Norma	Ensaio	Método	Requisito	Resultado Obtido	
N.A	Alongamento e Resistência à Tração do Revestimento externo	ABNT NBR 9141: 1998 e	O Alongamento e Resistência à Tração originais do revestimento externo devem atender aos valores estabelecidos na tabela 1 (Vide cópia da tabela no item 7.1.1 deste relatório)	Valores Obtidos (Velocidade de tração: 300 mm/min)	
				Alongamentoà ruptura	250 %
				Tração à ruptura	15,6 MPa
				Obs.: Conforme informação do cliente o material da capa é PVC 75 °	
N.A	Retenção do Alongamento e resistência à tração do revestimento externo	ABNT NBR 9148: 1998	A Retenção do Alongamento e da Resistência à Tração após envelhecimento do revestimento externo devem atender aos valores estabelecidos na tabela 2. (Vide cópia da tabela no item 7.1.1 deste relatório)	Valores obtidos após envelhecimento em estufa (100°C – 168h) (Velocidade de tração: 300 mm/min)	
				Retenção do Alongamento	95,3 %
				Retenção da Tração	103,3 %

OBS.: A incerteza expandida relatada é baseada em uma incerteza padronizada combinada, multiplicada por um fator de abrangência k fornecendo um nível de confiança de aproximadamente 95%.

7.1. Outras Informações

7.1.1. Cópia da página da Lista de requisitos de categoria I (Internet – Sítio da Anatel atualização de 23/12/08)

Produto: Cabo UTP e STP							
Documento normativo	Requisitos aplicáveis (vide nota II)					Procedimentos de ensaios	
	Tabela 1						
	Material	Descrição do material	Alongamento Mínimo (%)	Resistência à Tração Mínima (Mpa)			
	FEP	Etileno-polipropileno fluorretizado	200	17,2			
	FRPE	PE (polietileno) retardante à chama	100	8,3			
	PEAD	PE (polietileno) de alta densidade	300	16,5			
	PEBD	PE (polietileno) de baixa densidade	350	9,7			
	ETFE	Etileno-tetrafluoretileno	100	34,5			
	PVC	Policloreto de vinila	125	12,0			
	SRPVC	PVC semi-rígido	100	20,7			
	PTFE	Politetrafluoretileno	175	27,6			
	EVA	Etileno vinil acetato	100	8,3			
	PU	Poliuretano	300	10,0			
	Tabela 2						
	Classe (°C)	Material	Tempo (h)	Temperatura (°C)	Retenção do Original (%)		
					Alongamento		Resistência à Tração
	75	FRPE PEAD PEBD EVA PU	48	100	75		75
	75	PVC SRPVC	168 168	100 113	60 70		80 70
	90	PVC SRPVC	168 168	121 121	50 70		85 70
	90	EVA	168	100	75		80
	105	PVC SRPVC	168 168	136 136	50 70		85 70
	150	ETFE	168	180	75		85
	200	FEP	168	232	75		75
250	PTFE	1440	260	85	85		

7.1.2. Para os ensaios elétricos e de transmissão, foi utilizado um comprimento de 100 metros da amostra, que permaneceu climatizada 24 horas antes e durante o ensaio na temperatura de $20 \pm 3^\circ\text{C}$. Para os ensaios à 40°C e 60°C , a mesma amostra foi acondicionada em estufa com variação de $\pm 3^\circ\text{C}$.

8. DOCUMENTOS ASSOCIADOS

8.1. Documentos de Referência

[1] ANSI TIA/EIA-568-B.2 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling Components;

[2] ABNT NBR – 14703:2005 - Cabos de Telemática de 100 Ohms para Redes Internas Estruturadas;

[3] Requisitos Técnicos de Categoria I do sítio da Anatel na internet.

9. LISTA DE COLABORADORES

Tabela 6 – Lista de colaboradores

Nome	Empresa	Fone	E-mail
José Henrique D. Gongora	Versus	+55 (19) 2137-6816	jgongora@fitec.org.br
Gabriel M. Quinteiro Jr	Fltec	+55 (19) 2137-6944	gquinteiro@fitec.org.br

10. ANEXOS

Relatórios emitidos pelo equipamento automático de teste SISTEMA A1.

[AMO-09012-V01][PP].pdf
[AMO-09012-V01][20GRAUS].pdf
[AMO-09012-V01][40GRAUS].pdf
[AMO-09012-V01][60GRAUS].pdf
[AMO-09012-V01][DS].pdf

CABEÇALHO

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Ensaio	PP	Temperatura	21°C
Produto	Cabo Lan Categoria 5e Flexível	Data	20/2/2009
Tecnico	JGONGORA	Hora	14:35
		Observacao	
Categoria	CAT5e_Flex	Certificacao	SIM

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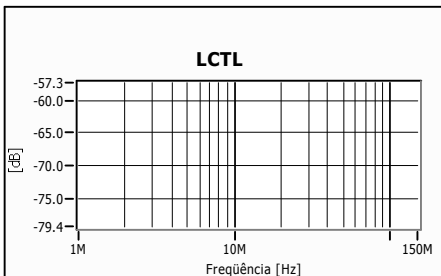
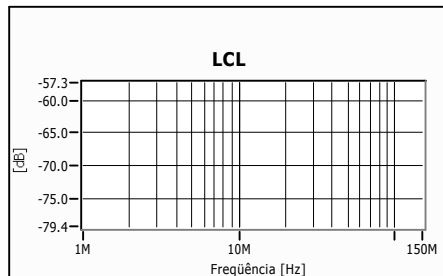
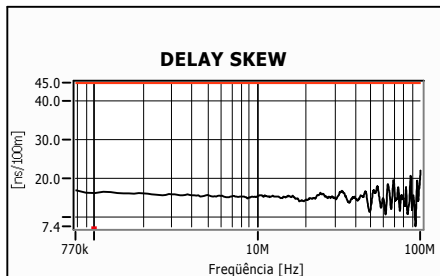
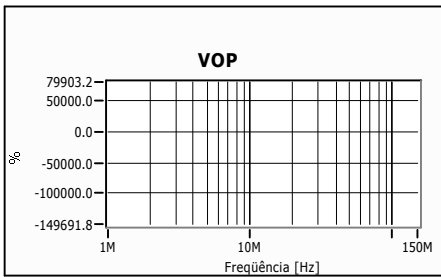
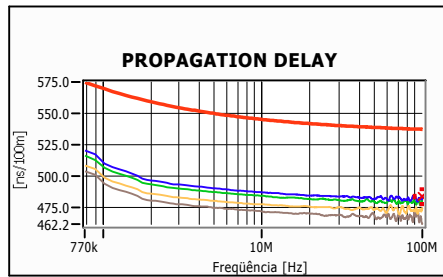
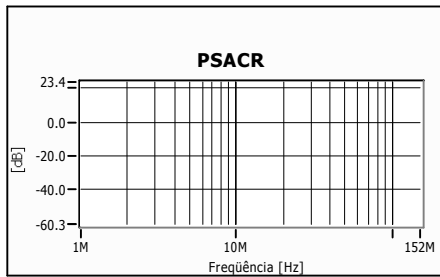
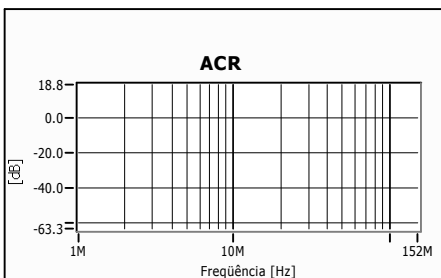
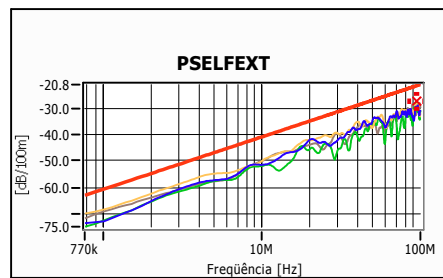
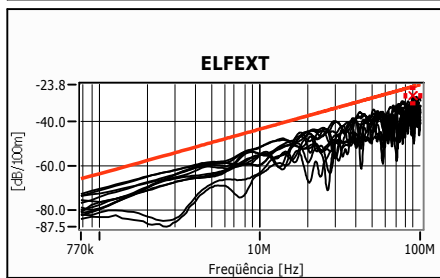
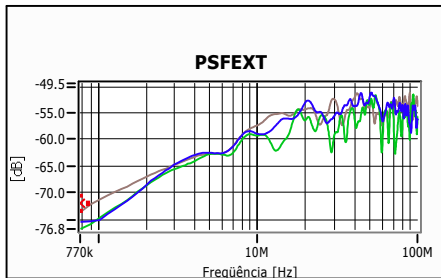
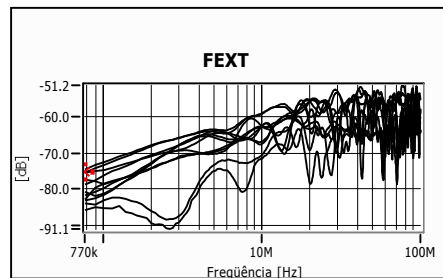
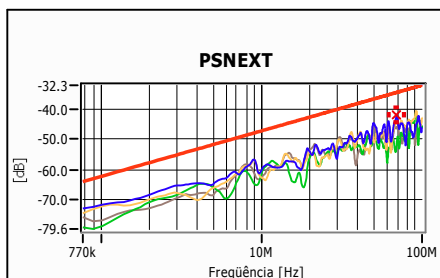
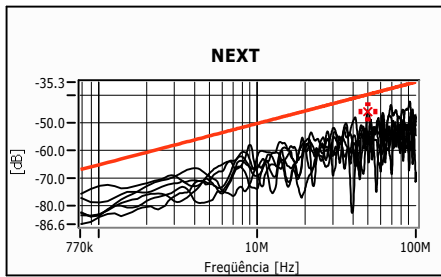
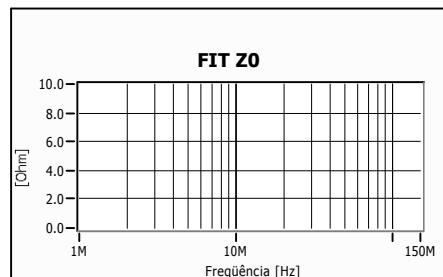
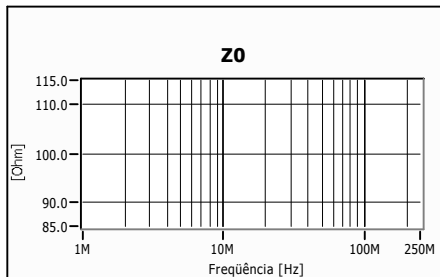
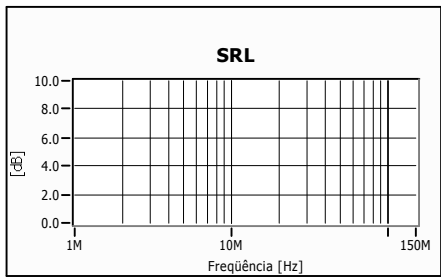
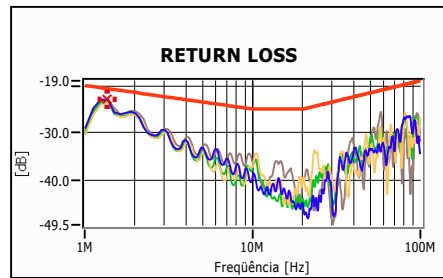
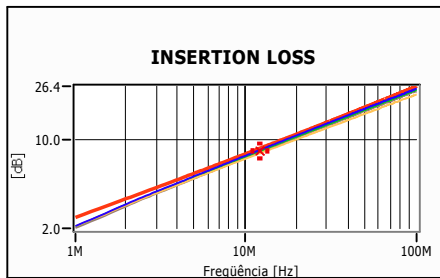
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CABEÇALHO

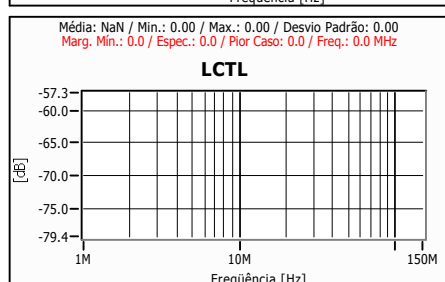
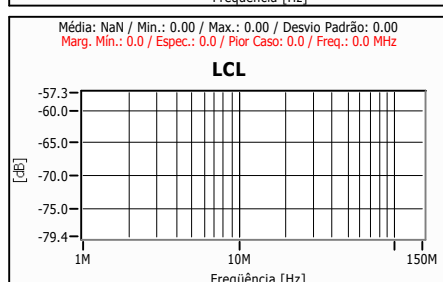
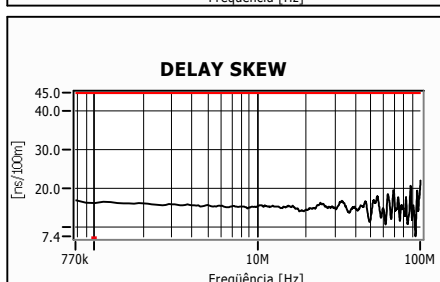
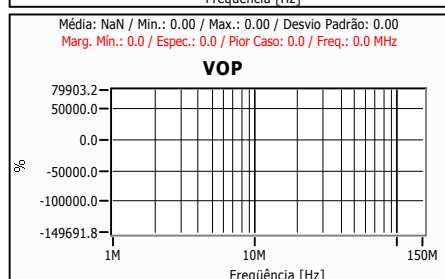
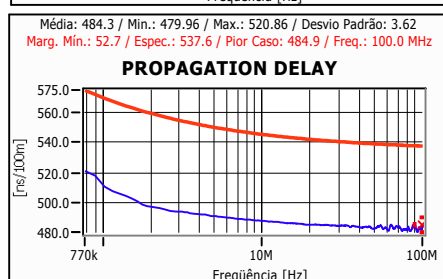
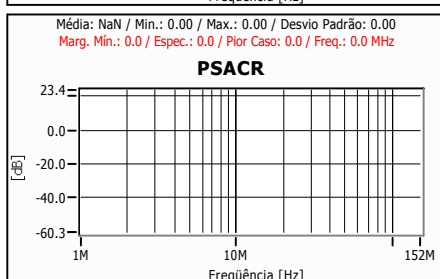
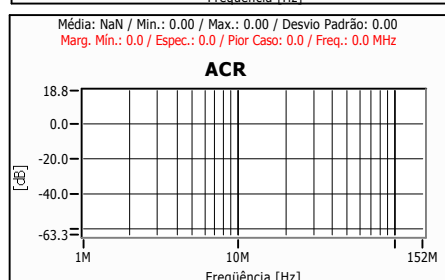
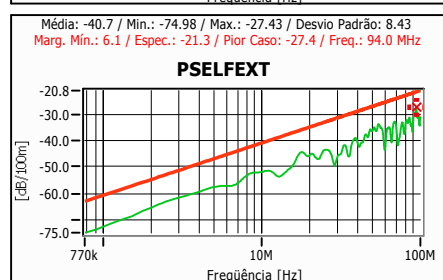
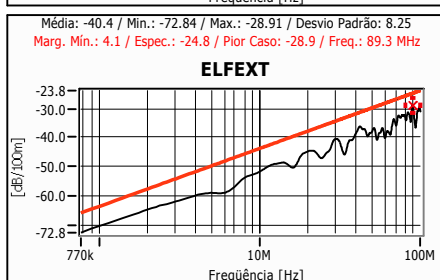
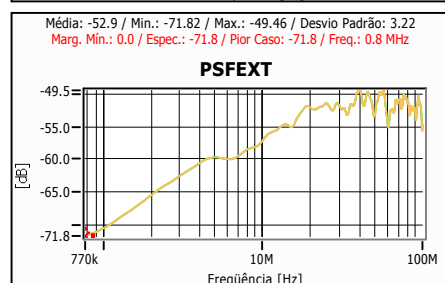
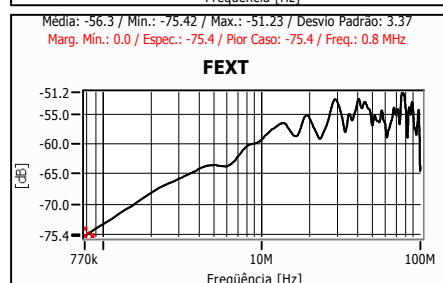
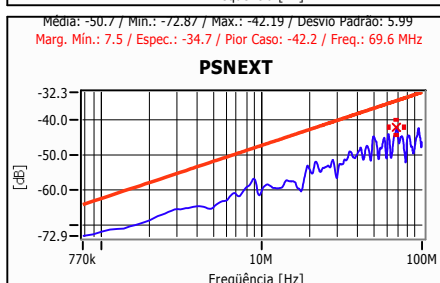
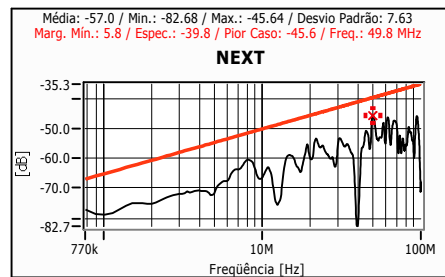
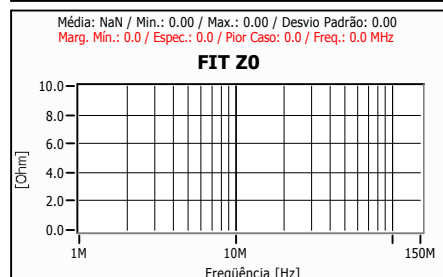
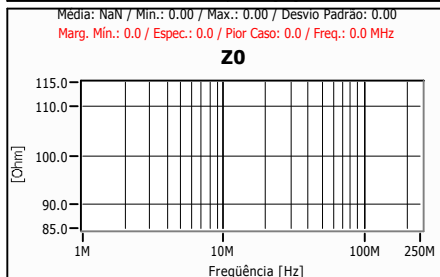
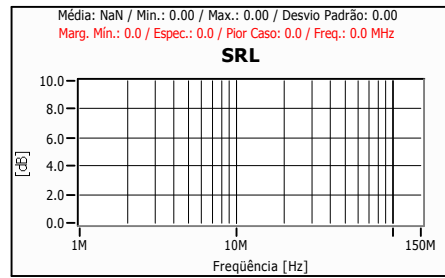
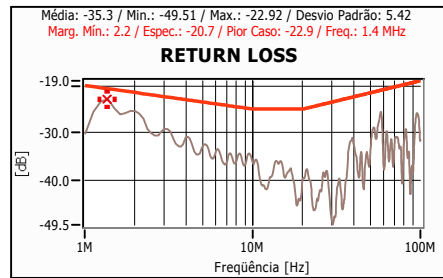
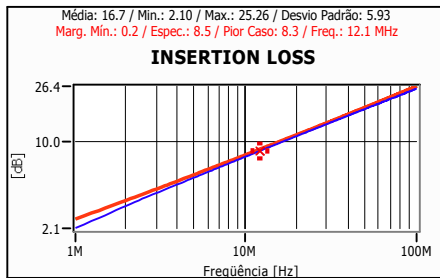
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Produto	Cabo Lan Categoria 5e Flexível	Data	18/2/2009
Tecnico	JGONGORA	Hora	08:59
		Observacao	
Categoria	CAT5e_FLEX	Certificacao	SIM

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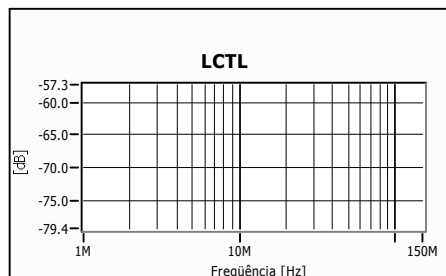
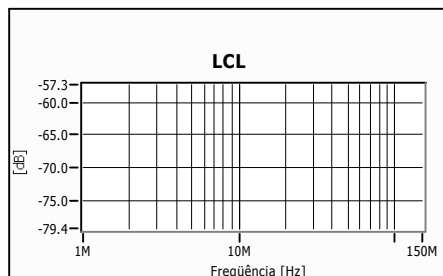
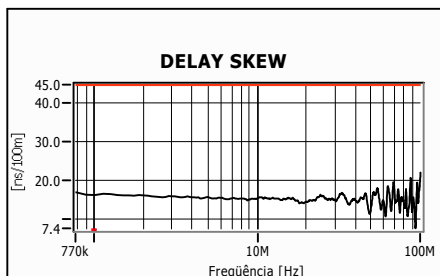
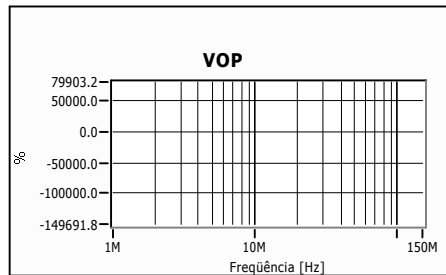
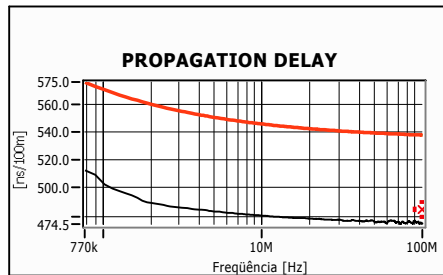
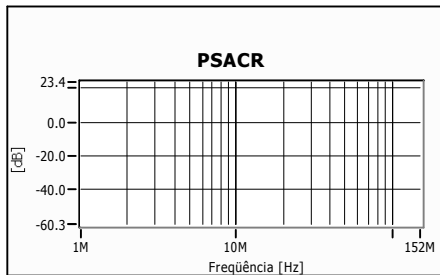
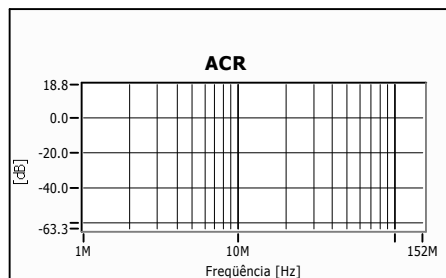
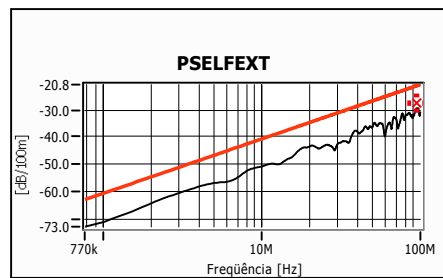
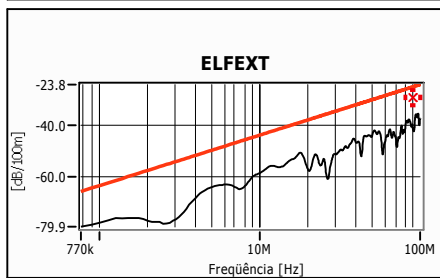
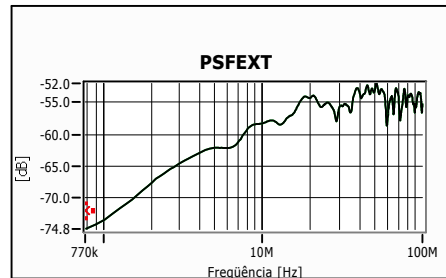
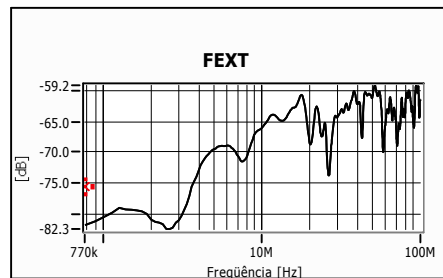
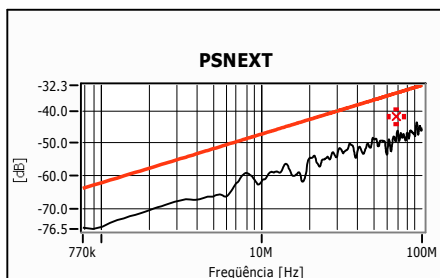
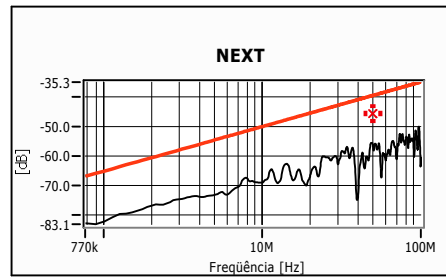
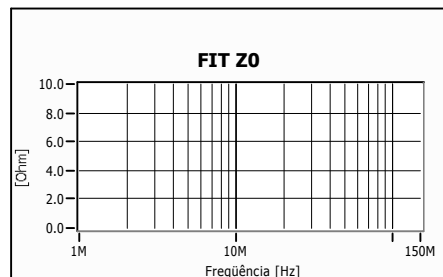
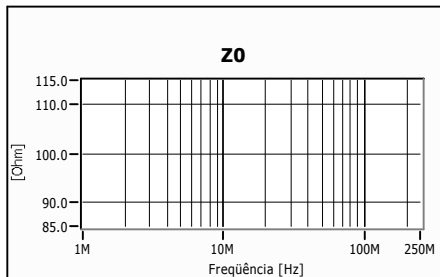
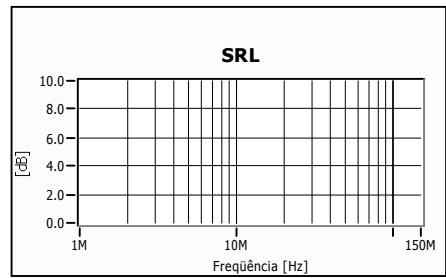
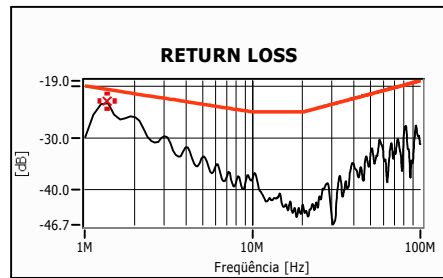
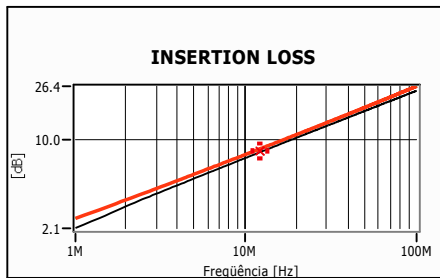
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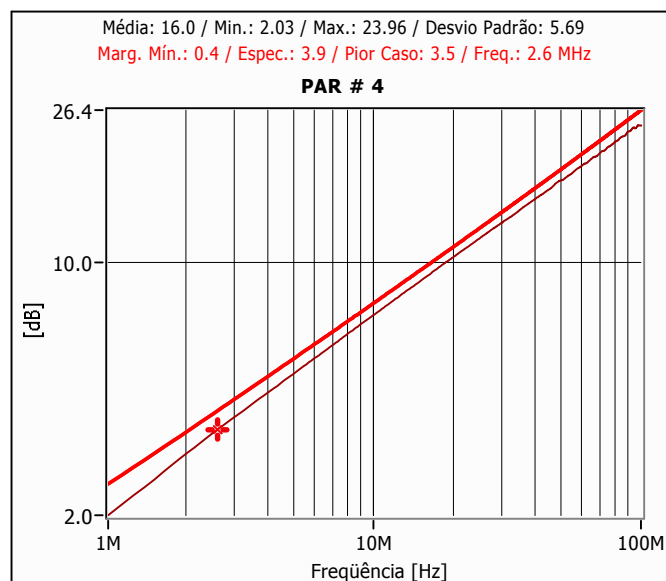
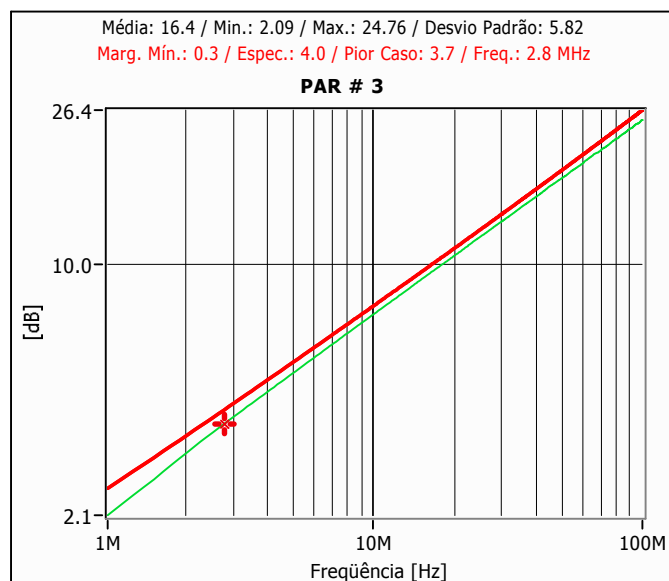
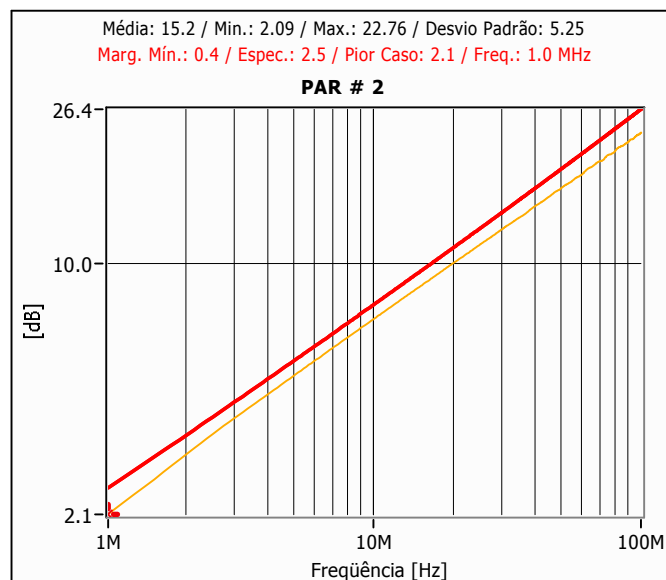
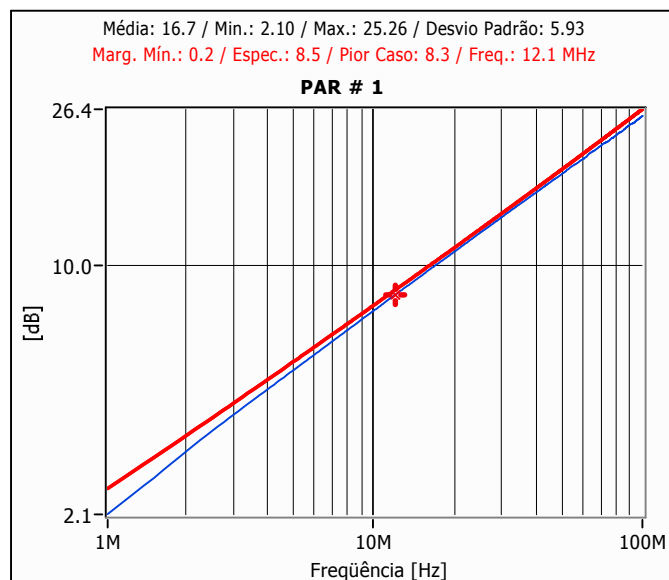
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MÉDIAS

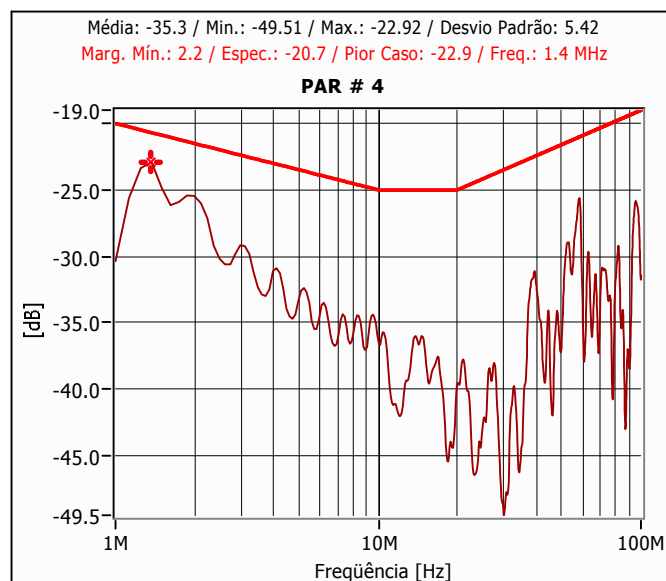
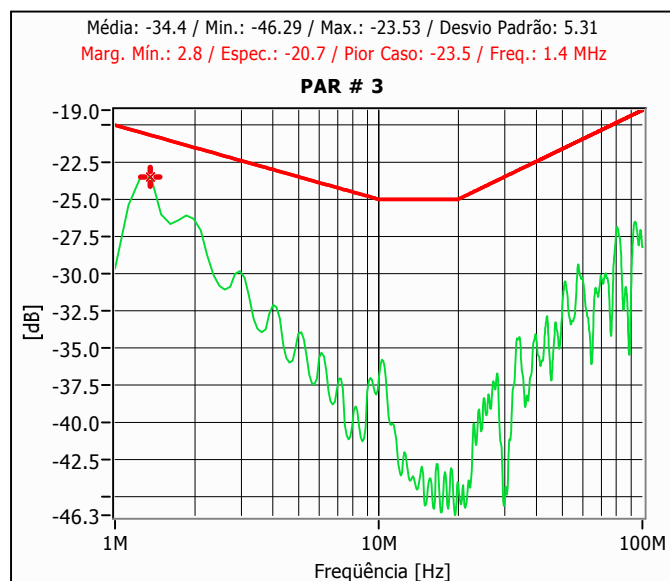
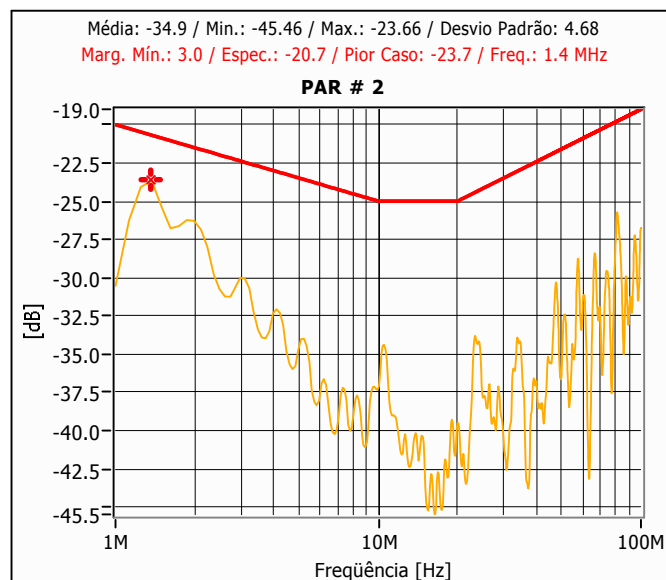
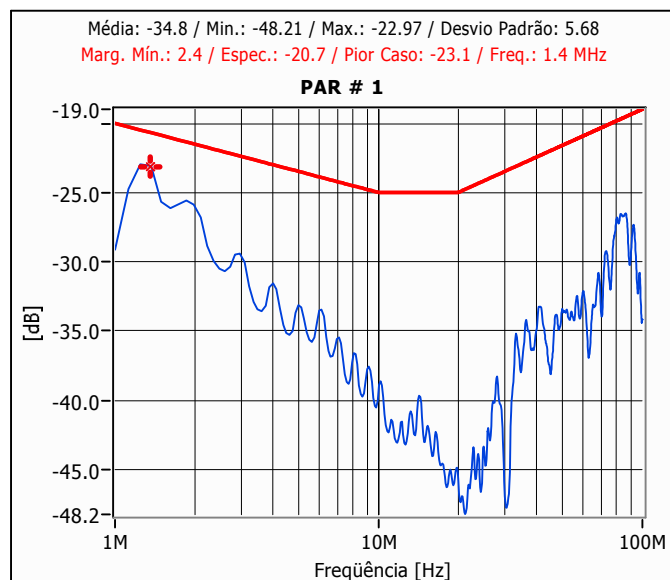


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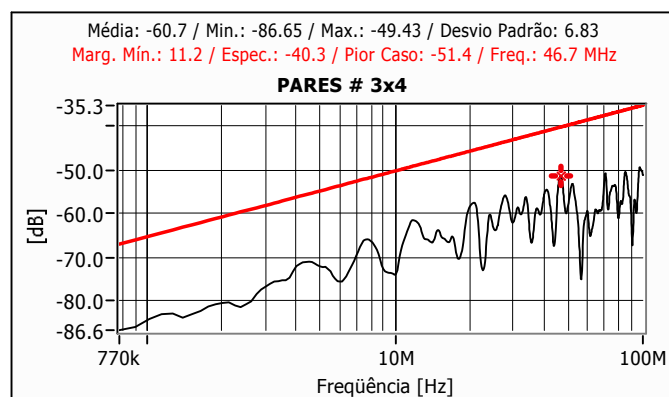
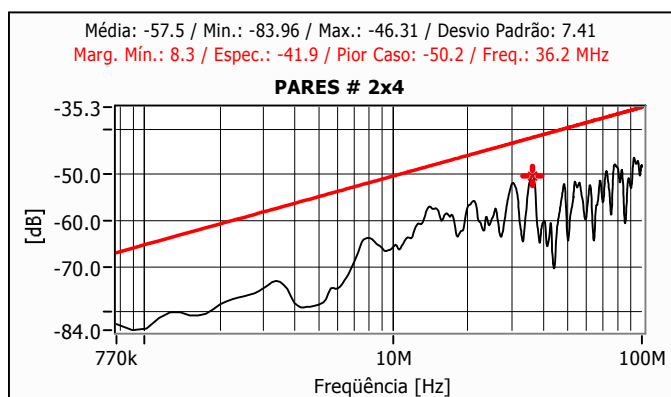
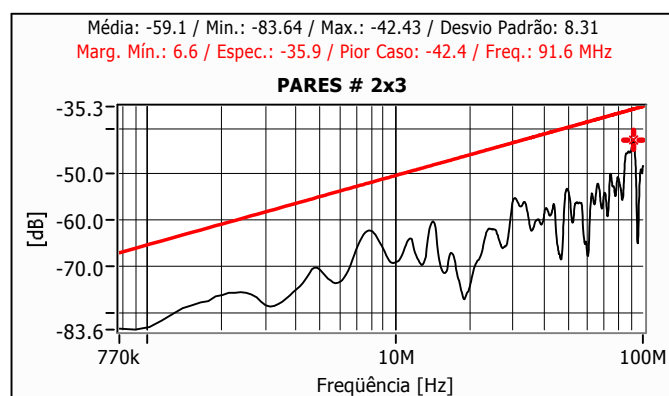
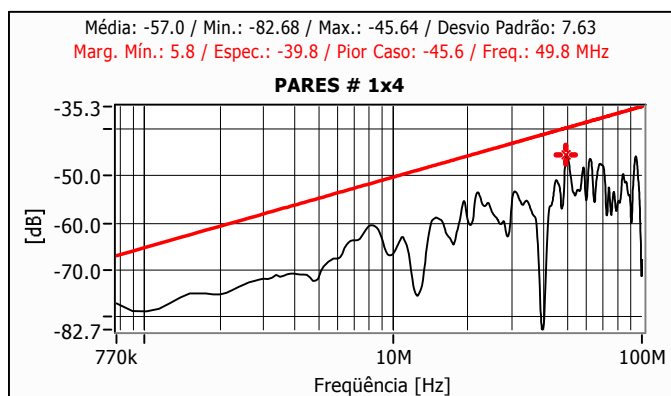
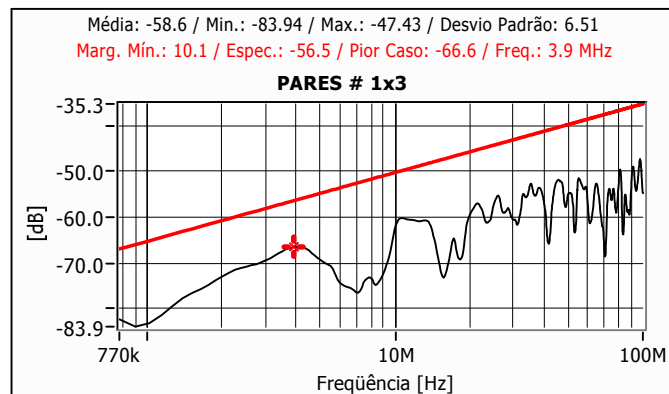
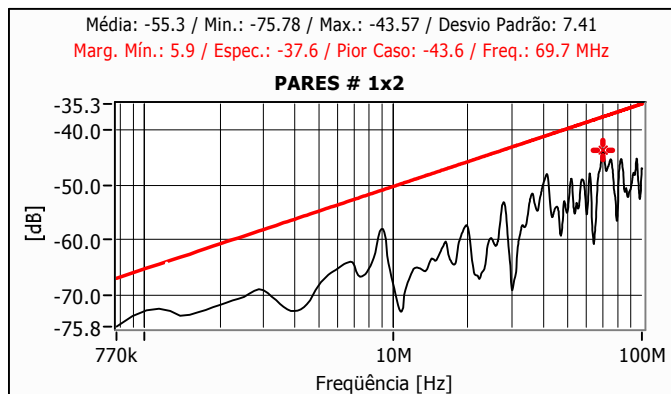
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8.00	6.64	6.31	6.52	6.37	6.31	6.64	6.46
10.00	7.48	7.07	7.34	7.18	7.07	7.48	7.27
16.00	9.65	9.02	9.46	9.26	9.02	9.65	9.34
20.00	10.85	10.10	10.62	10.43	10.10	10.85	10.49
25.00	12.21	11.30	11.95	11.72	11.30	12.21	11.78
31.25	13.76	12.67	13.44	13.17	12.67	13.76	13.24
62.50	19.78	18.05	19.40	18.86	18.05	19.78	18.97
100.00	25.29	22.77	24.78	23.95	22.77	25.29	24.09

RETURN LOSS



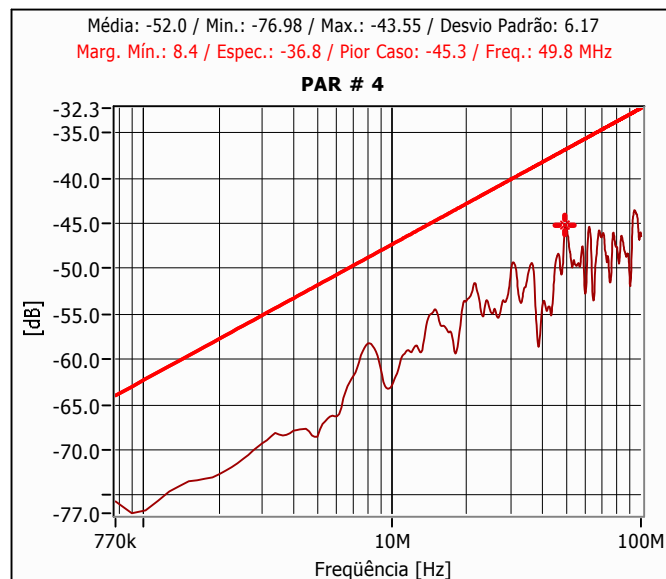
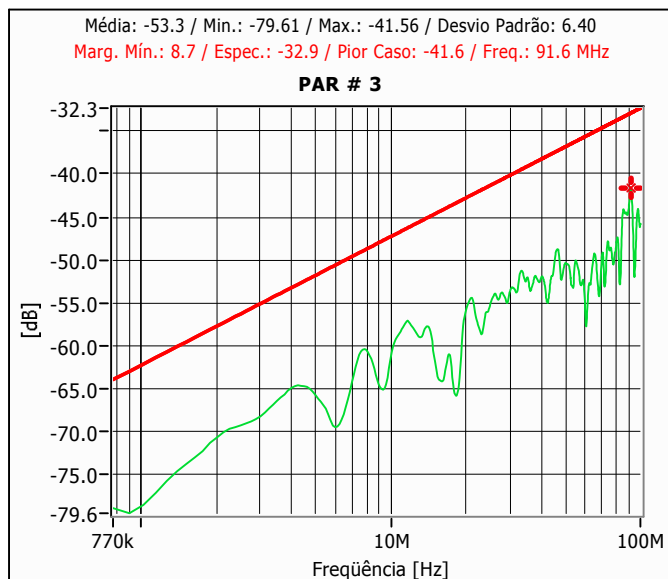
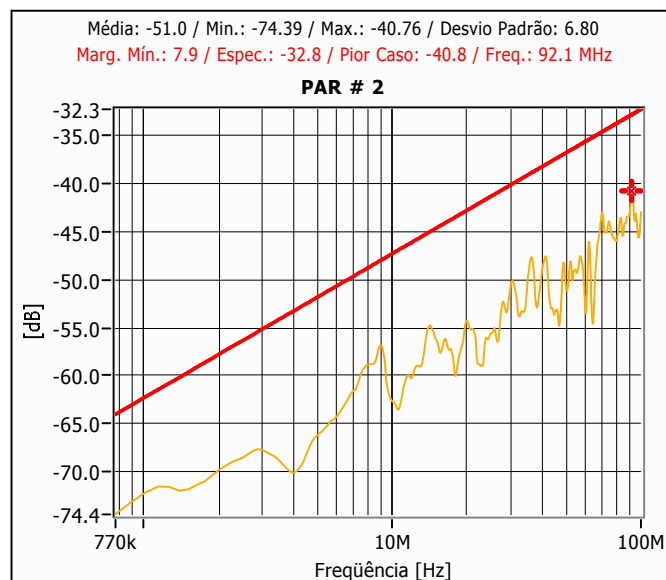
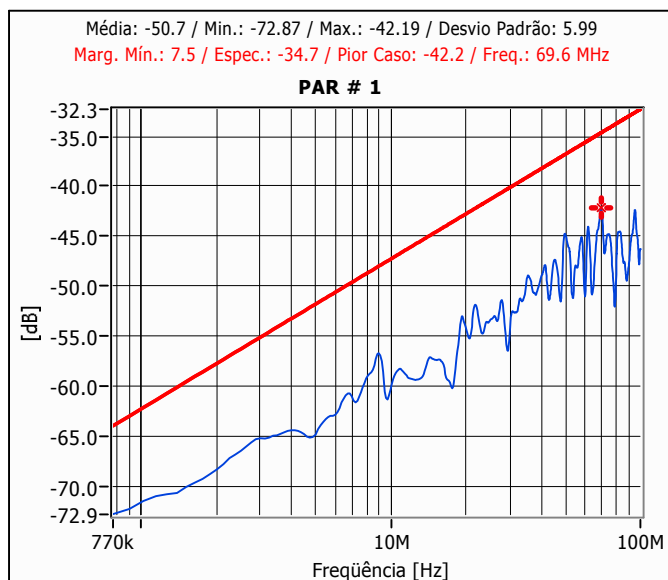
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4.00	31.55	32.34	32.12	31.11	31.11	32.34	31.81
8.00	36.60	38.86	39.24	35.70	35.70	39.24	37.85
10.00	38.87	37.11	36.93	36.57	36.57	38.87	37.47
16.00	44.04	42.85	45.03	38.76	38.76	45.03	43.22
20.00	45.85	39.48	44.30	39.53	39.48	45.85	43.18
25.00	43.34	37.83	38.43	42.67	37.83	43.34	41.23
31.25	46.74	41.55	41.59	47.67	41.55	47.67	45.26
62.50	36.87	38.46	33.18	30.62	30.62	38.46	35.77
100.00	34.17	26.75	28.23	31.46	26.75	34.17	31.09

NEXT



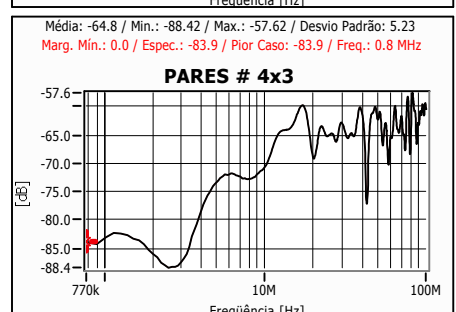
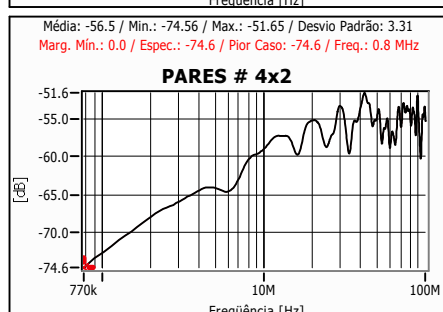
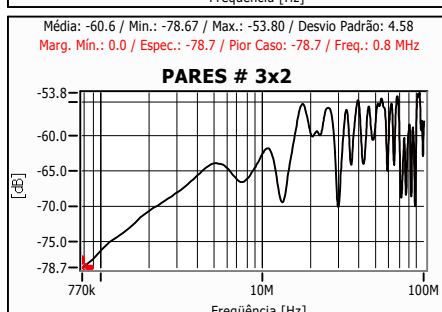
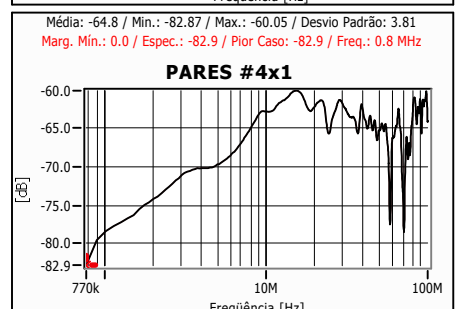
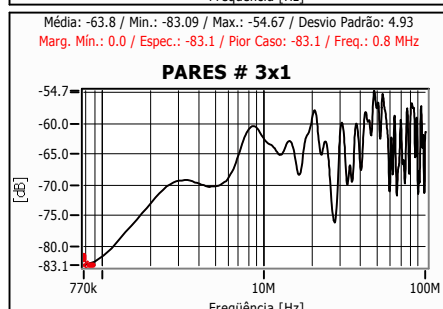
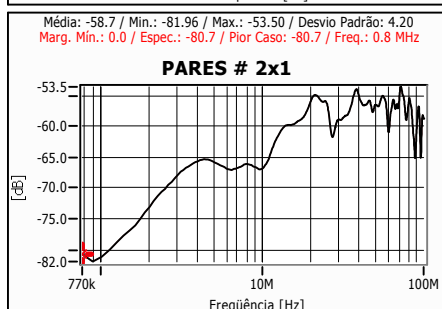
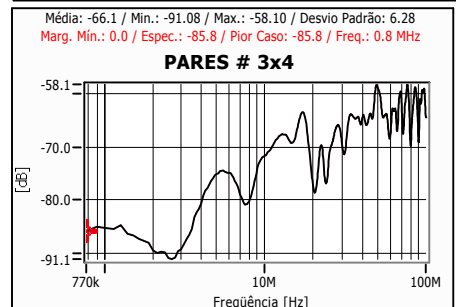
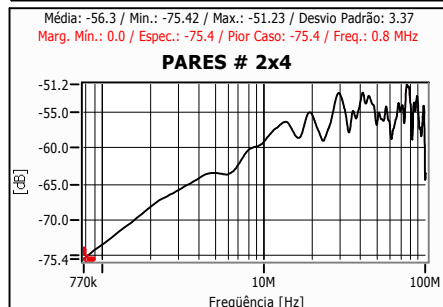
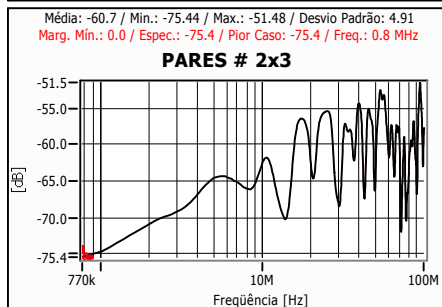
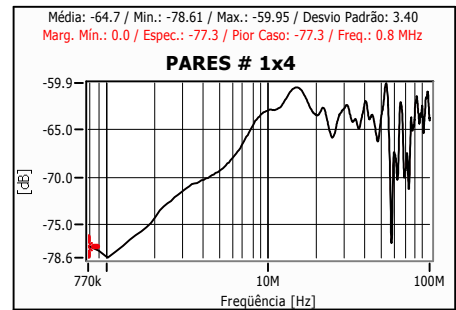
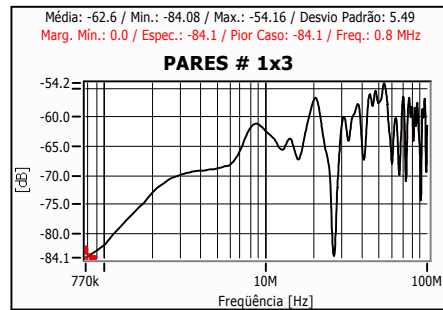
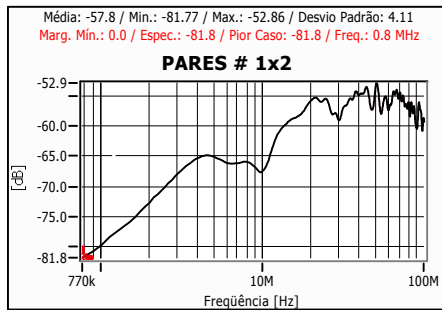
FREQ.	1x2	1x3	1x4	2x3	2x4	3x4	MIN.	MAX.	MÉDIA
0.77	75.78	82.31	77.13	83.48	82.59	86.65	75.78	86.65	82.74
1.00	72.82	83.16	78.84	83.09	83.57	84.04	72.82	84.04	82.17
4.00	72.95	66.50	70.77	74.92	77.98	71.98	66.50	77.98	73.86
8.00	65.33	73.22	60.75	62.21	63.82	66.23	60.75	73.22	67.51
10.00	67.78	62.77	66.65	69.18	65.88	73.95	62.77	73.95	69.16
16.00	60.71	72.28	60.79	71.27	58.96	66.09	58.96	72.28	67.96
20.00	57.94	59.56	59.74	74.39	56.84	58.45	56.84	74.39	67.15
25.00	59.87	57.48	57.71	61.90	59.60	63.31	57.48	63.31	60.50
31.25	65.02	61.53	53.60	56.06	53.36	58.61	53.36	65.02	60.13
62.50	52.03	59.52	46.95	54.26	54.44	63.37	46.95	63.37	58.04
100.00	47.04	54.72	67.89	48.21	48.24	51.17	47.04	67.89	60.52

PSNEXT



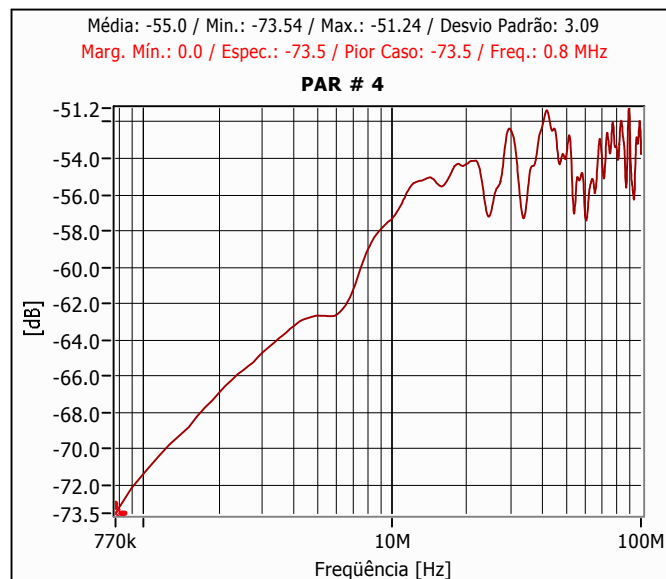
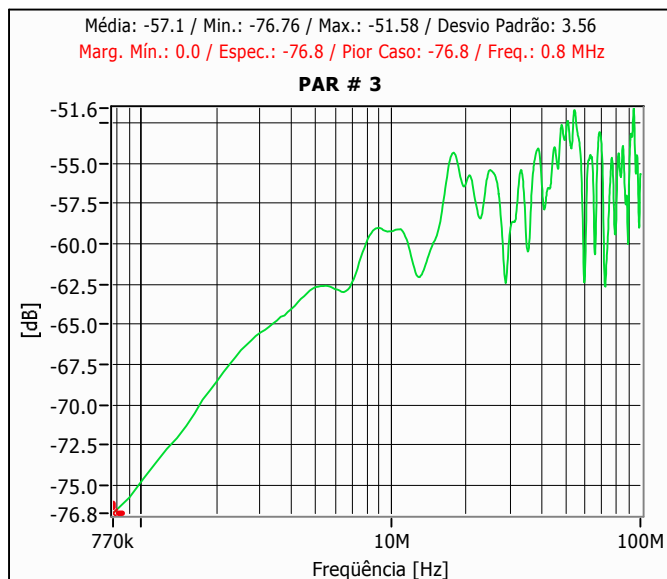
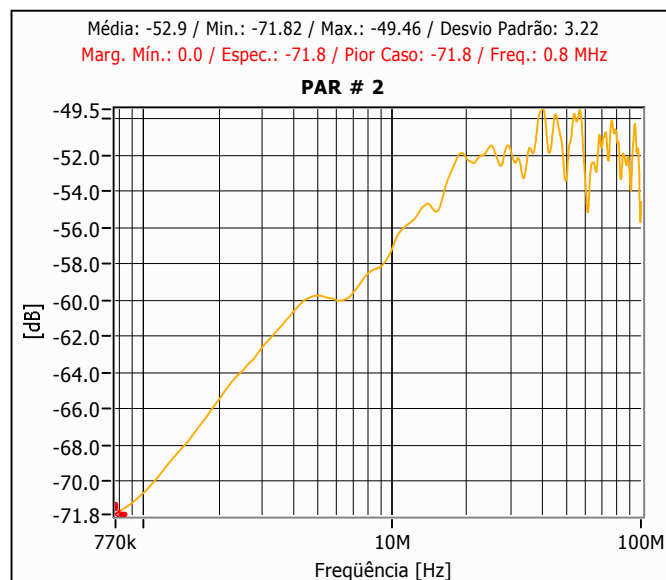
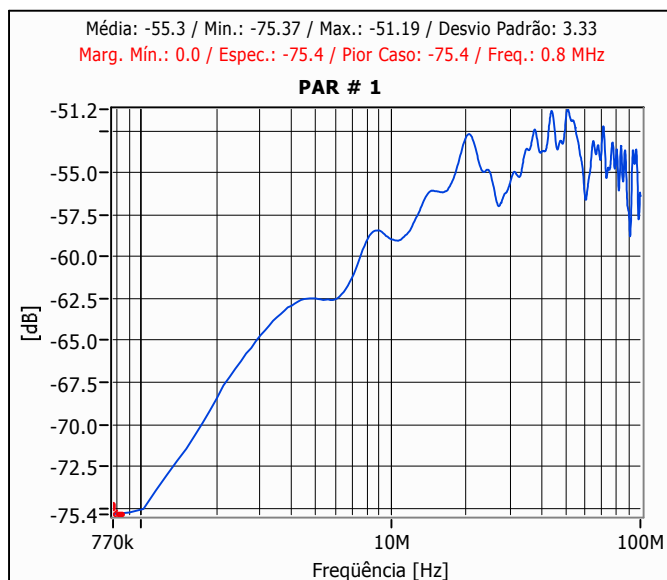
FREQ.	1	2	3	4	MIN.	MAX.	MÉDIA
0.77	72.87	74.39	79.02	75.68	72.87	79.02	76.12
1.00	71.54	72.11	78.64	76.70	71.54	78.64	75.75
4.00	64.46	70.05	64.96	67.88	64.46	70.05	67.44
8.00	59.27	58.83	60.52	58.25	58.25	60.52	59.30
10.00	60.40	62.63	61.61	62.88	60.40	62.88	61.99
16.00	57.59	56.59	64.20	56.29	56.29	64.20	60.09
20.00	54.23	54.31	55.90	53.41	53.41	55.90	54.56
25.00	53.46	55.57	55.38	54.87	53.46	55.57	54.89
31.25	52.69	51.30	53.41	49.85	49.85	53.41	52.02
62.50	45.60	48.66	52.74	46.16	45.60	52.74	49.28
100.00	46.33	43.02	45.83	46.42	43.02	46.42	45.59

FEXT



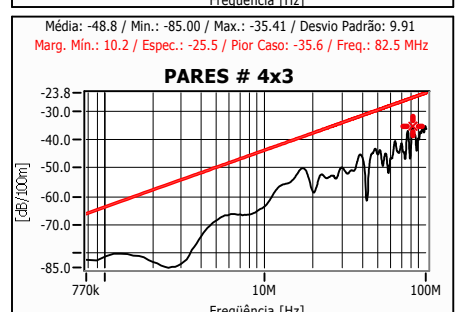
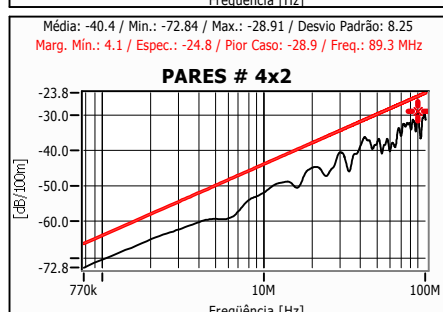
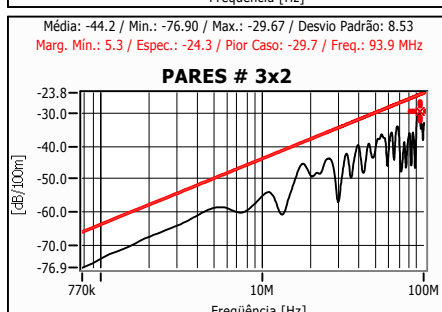
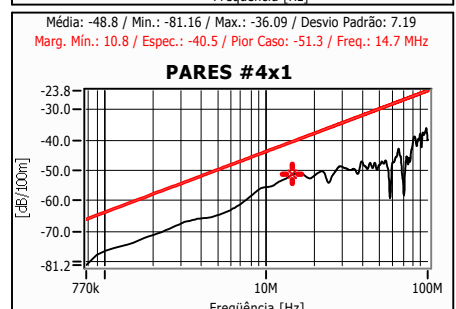
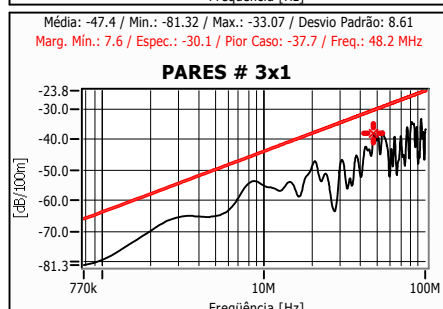
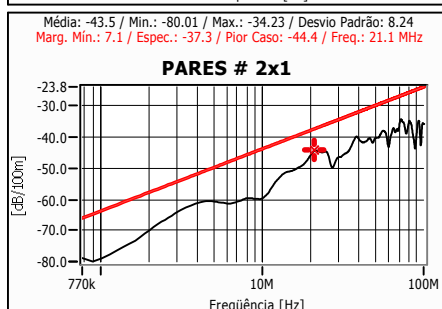
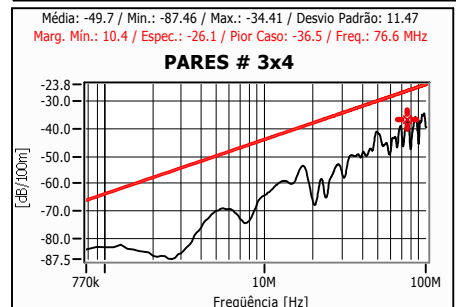
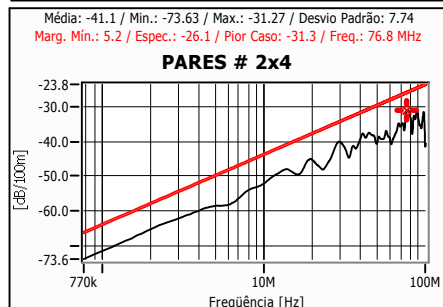
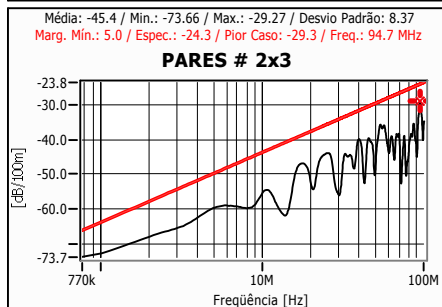
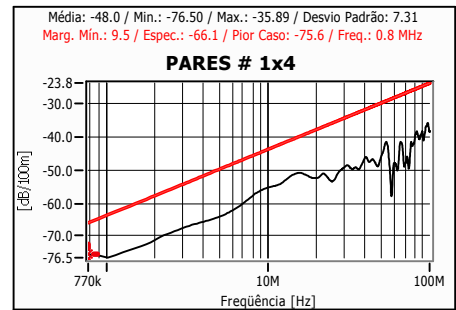
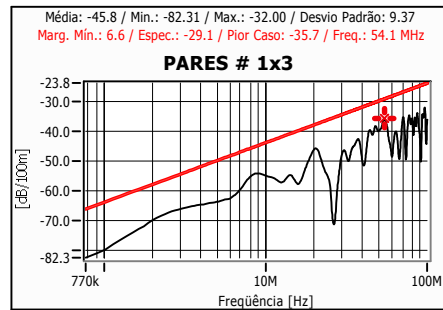
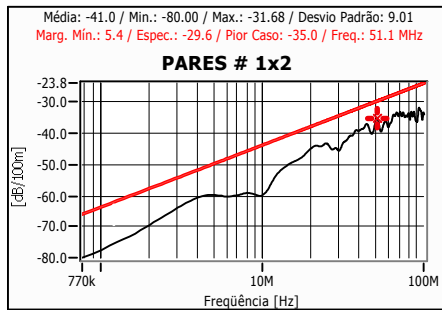
FREQ.	1x2	1x3	1x4	2x3	2x4	3x4	2x1	3x1	4x1	3x2	4x2	4x3	MIN.	MAX.	MÉDIA
1.00	79.70	81.77	78.61	74.69	73.31	85.26	81.19	81.50	78.45	76.11	72.51	83.07	72.51	85.26	80.37
4.00	65.28	69.18	70.30	66.82	64.16	80.61	65.65	69.84	70.18	65.50	64.41	78.44	64.16	80.61	73.10
8.00	65.89	62.05	64.60	66.06	60.43	80.23	66.06	61.21	65.05	66.16	60.51	72.79	60.43	80.23	71.02
10.00	67.53	62.30	62.91	62.74	59.27	71.59	66.88	62.41	62.76	62.60	59.08	70.70	59.08	71.59	66.14
16.00	58.59	67.25	60.68	58.87	58.55	65.68	59.44	67.43	60.18	59.44	59.74	60.98	58.55	67.43	62.81
20.00	55.77	56.88	63.38	62.74	55.54	78.04	55.78	58.92	62.13	59.69	55.26	69.26	55.26	78.04	68.32
25.00	55.47	69.95	65.76	55.42	57.53	71.49	56.04	64.90	65.16	56.08	58.50	65.10	55.42	71.49	65.24
31.25	57.35	60.90	62.47	62.06	54.23	71.07	58.72	61.80	62.60	62.04	54.54	64.34	54.23	71.07	63.50
62.50	56.39	61.65	69.55	57.65	57.96	62.88	57.48	68.23	65.49	55.59	56.74	63.43	55.59	69.55	63.66
100.00	59.26	61.46	63.93	57.78	63.55	64.35	58.65	61.42	64.04	57.89	55.33	60.50	55.33	64.35	61.52

PSFEXT



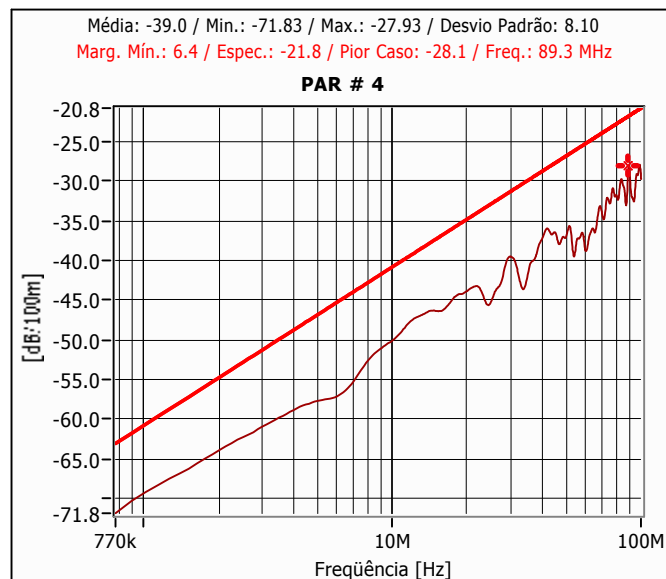
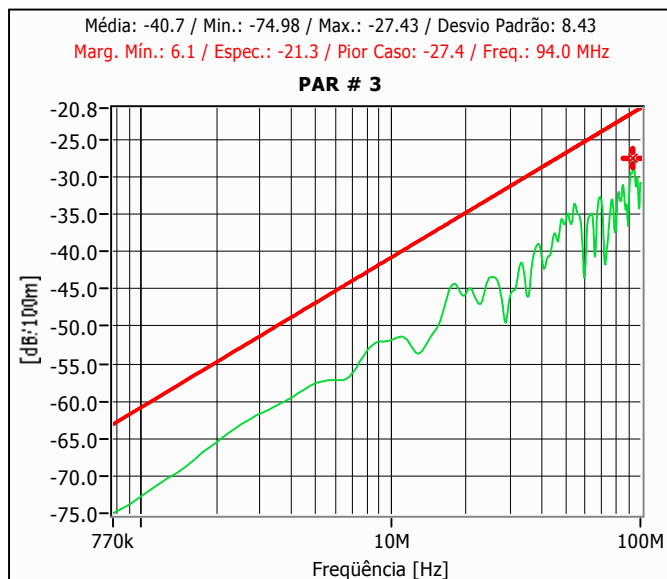
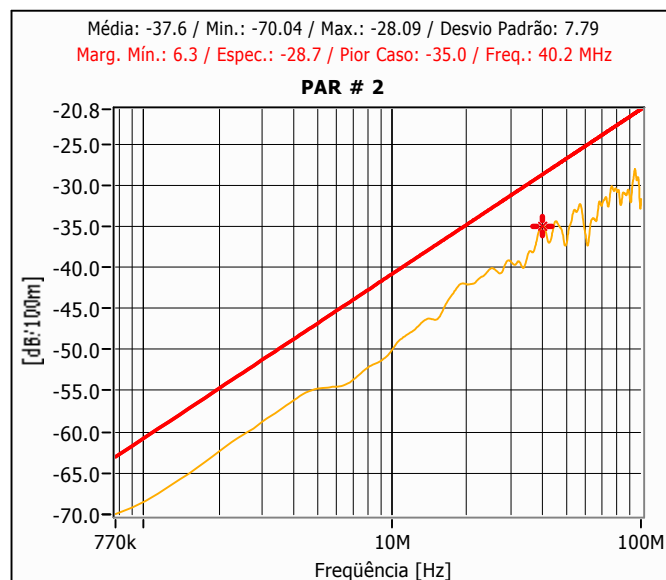
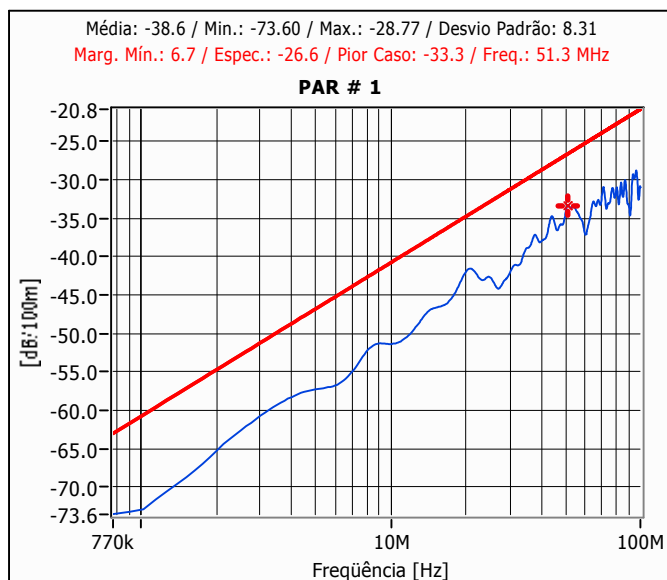
FREQ.	1	2	3	4	MIN.	MAX.	MÉDIA
1.00	75.06	70.54	74.62	71.23	70.54	75.06	73.31
4.00	62.92	60.64	64.04	63.25	60.64	64.04	62.88
8.00	59.11	58.54	59.97	59.02	58.54	59.97	59.19
10.00	58.94	57.17	59.23	57.33	57.17	59.23	58.27
16.00	56.15	54.17	57.99	55.50	54.17	57.99	56.17
20.00	52.87	52.24	56.25	54.31	52.24	56.25	54.20
25.00	54.95	51.47	55.43	56.93	51.47	56.93	55.10
31.25	54.92	52.41	58.65	53.53	52.41	58.65	55.57
62.50	55.10	52.92	54.65	55.45	52.92	55.45	54.63
100.00	56.37	54.59	55.67	53.75	53.75	56.37	55.21

ELFEXT



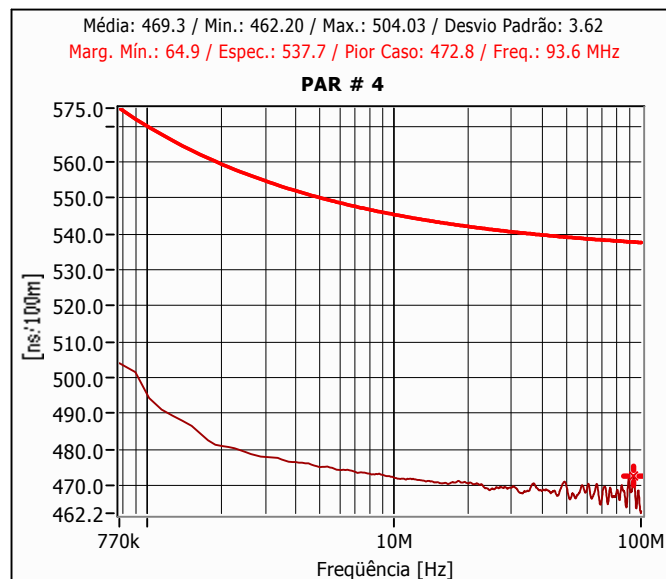
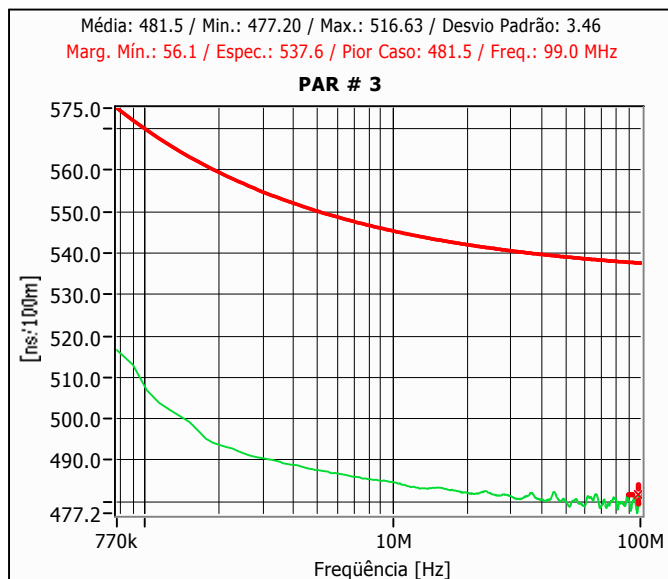
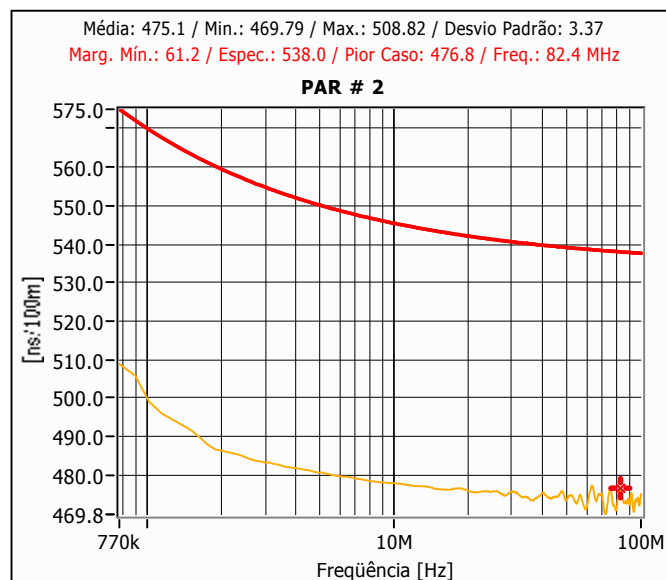
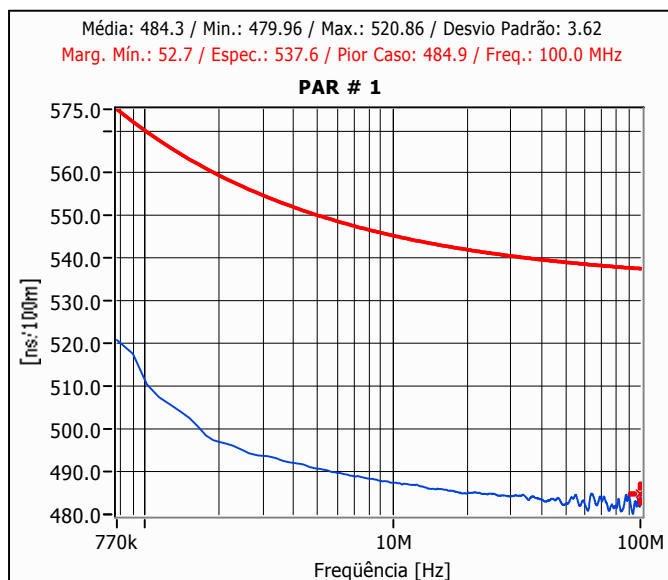
FREQ.	1x2	1x3	1x4	2x3	2x4	3x4	2x1	3x1	4x1	3x2	4x2	4x3	MIN.	MAX.	MÉDIA
1.00	77.59	79.66	76.50	72.59	71.20	83.16	79.08	79.40	76.41	74.01	70.47	81.04	70.47	83.16	78.28
4.00	60.69	64.59	65.71	62.39	59.73	76.09	61.22	65.32	65.78	60.97	60.00	74.04	59.73	76.09	68.61
8.00	59.23	55.39	57.93	59.72	54.10	73.68	59.73	54.66	58.66	59.61	54.12	66.39	54.10	73.68	64.50
10.00	60.02	54.79	55.40	55.64	52.17	64.22	59.78	55.04	55.55	55.22	51.87	63.50	51.87	64.22	58.84
16.00	48.89	57.56	50.99	49.81	49.50	56.19	50.39	57.93	50.89	49.94	50.44	51.68	48.89	57.93	53.33
20.00	44.88	45.98	52.48	52.60	45.40	67.38	45.64	48.26	51.66	49.02	44.79	58.79	44.79	67.38	57.69
25.00	43.21	57.69	53.50	44.08	46.18	59.50	44.70	52.90	53.39	44.08	46.73	53.33	43.21	59.50	53.22
31.25	43.54	47.09	48.66	49.34	41.51	57.57	45.99	48.31	49.38	48.55	41.32	51.12	41.32	57.57	50.10
62.50	36.54	41.79	49.69	39.53	39.84	43.41	39.36	48.76	46.55	36.12	37.81	44.49	36.12	49.69	44.27
100.00	33.86	36.07	38.54	34.92	40.69	39.47	35.80	36.55	39.99	33.01	31.29	36.46	31.29	40.69	37.23

PSELFEXT



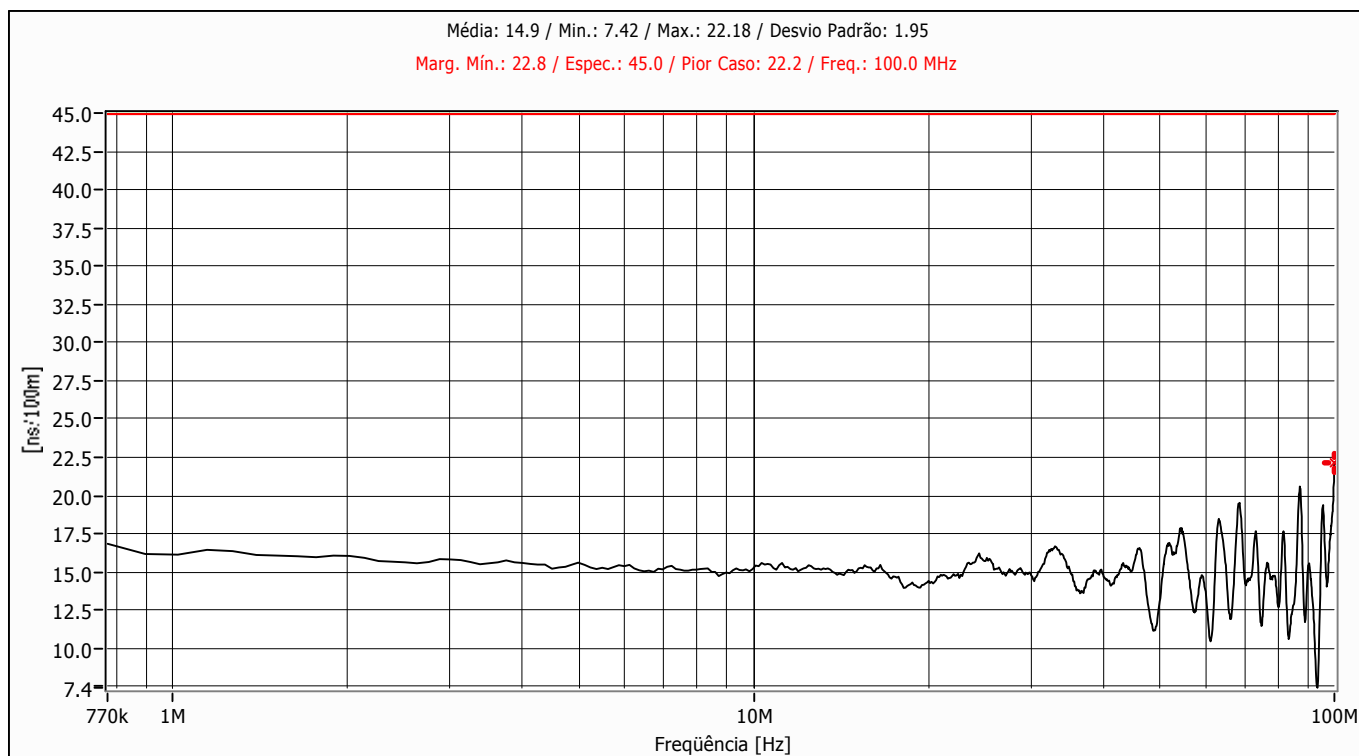
FREQ.	1	2	3	4	MIN.	MAX.	MÉDIA
1.00	72.95	68.44	72.52	69.20	68.44	72.95	71.21
4.00	58.33	56.21	59.51	58.85	56.21	59.51	58.39
8.00	52.44	52.20	53.41	52.62	52.20	53.41	52.69
10.00	51.43	50.07	51.86	50.12	50.07	51.86	50.94
16.00	46.45	45.11	48.49	46.20	45.11	48.49	46.74
20.00	41.98	42.10	45.58	43.83	41.98	45.58	43.63
25.00	42.69	40.13	43.44	45.17	40.13	45.17	43.21
31.25	41.11	39.69	45.16	40.31	39.69	45.16	42.16
62.50	35.24	34.80	35.18	36.51	34.80	36.51	35.49
100.00	30.98	31.74	30.79	29.71	29.71	31.74	30.86

PROPAGATION DELAY



FREQ.	1	2	3	4	MIN.	MAX.	MÉDIA
1.00	510.42	499.01	506.89	494.28	494.28	506.89	502.65
4.00	491.98	481.76	488.88	476.40	476.40	488.88	484.76
8.00	488.35	478.50	485.37	473.20	473.20	485.37	481.35
10.00	487.34	477.84	484.82	472.17	472.17	484.82	480.54
16.00	485.74	476.18	483.17	470.63	470.63	483.17	478.93
20.00	484.84	475.90	482.10	470.41	470.41	482.10	478.31
25.00	484.80	475.72	481.88	469.07	469.07	481.88	477.87
31.25	484.41	475.40	480.77	469.14	469.14	480.77	477.43
62.50	483.29	476.41	480.80	466.89	466.89	480.80	476.85
100.00	484.87	474.99	479.48	462.69	462.69	479.48	475.51

DELAY SKEW



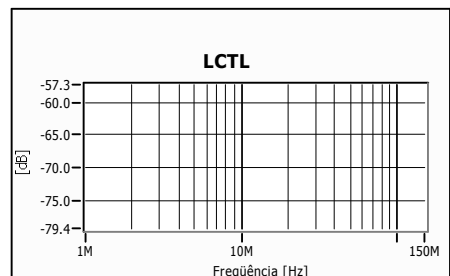
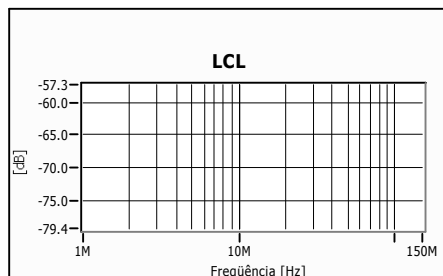
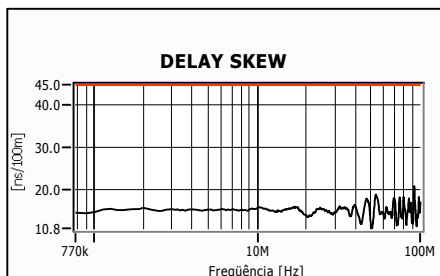
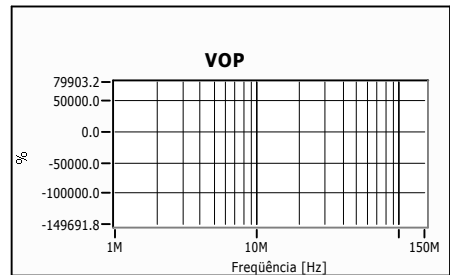
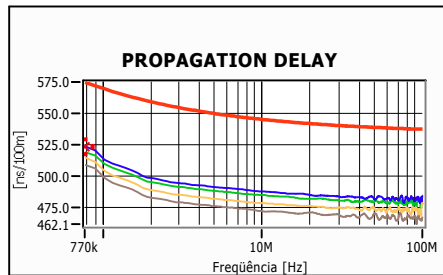
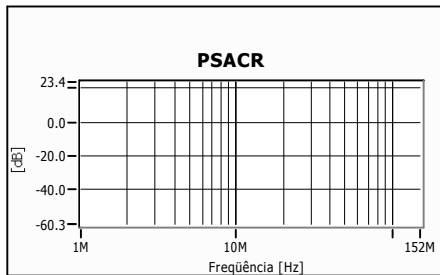
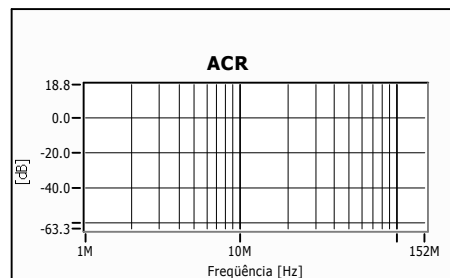
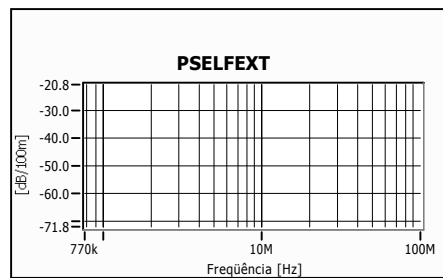
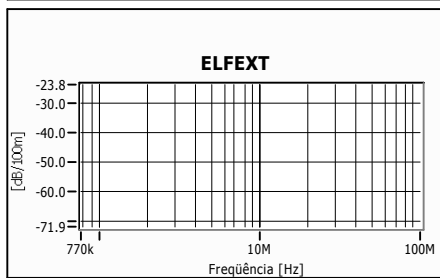
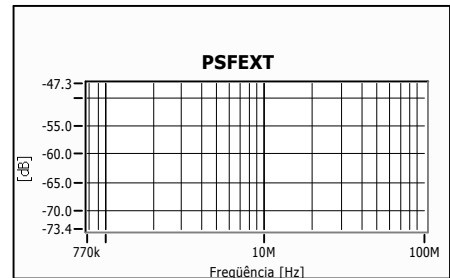
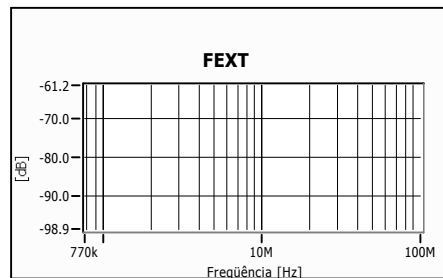
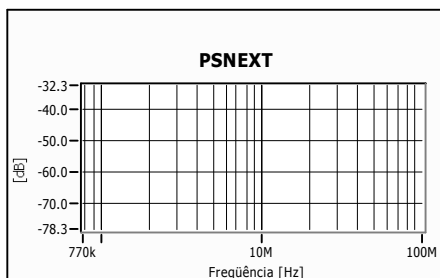
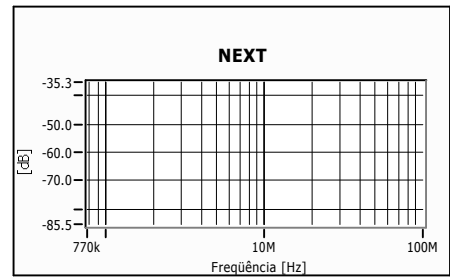
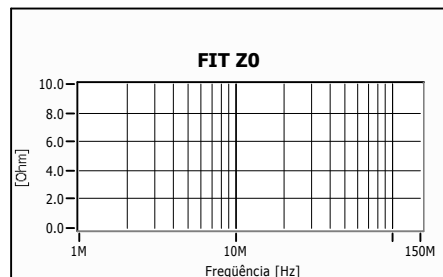
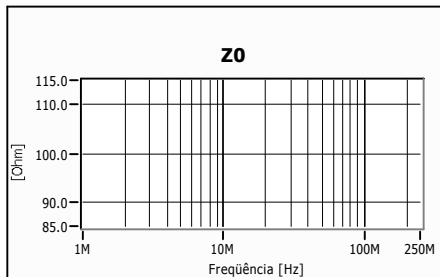
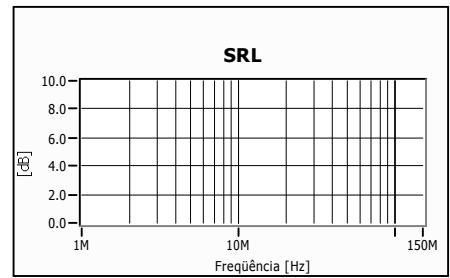
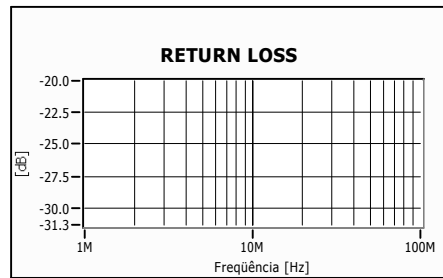
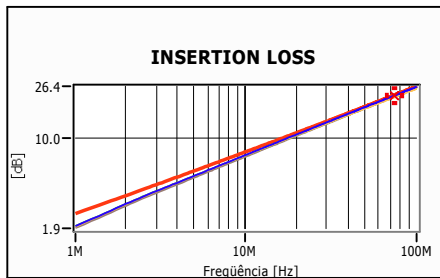
FREQ.	VALOR
1.00	16.14
4.00	15.59
8.00	15.15
10.00	15.18
16.00	15.12
20.00	14.43
25.00	15.73
31.25	15.28
62.50	16.40
100.00	22.18

CABEÇALHO

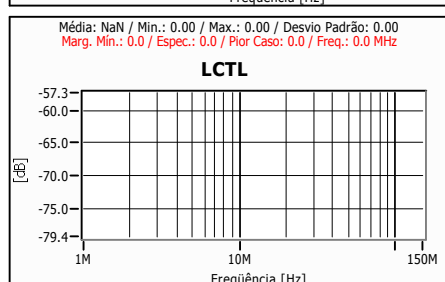
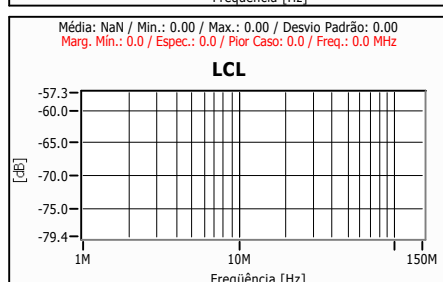
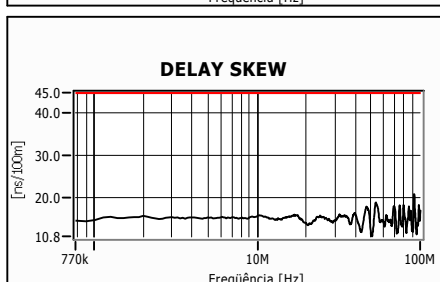
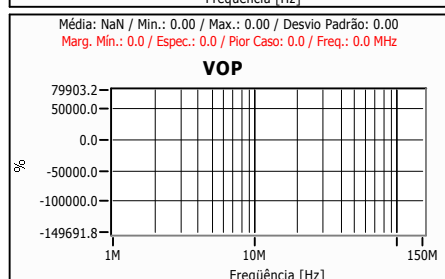
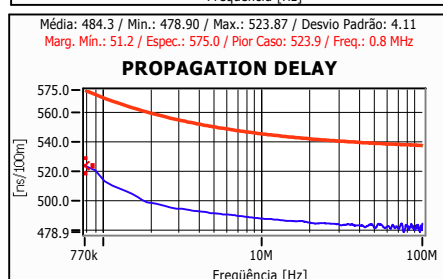
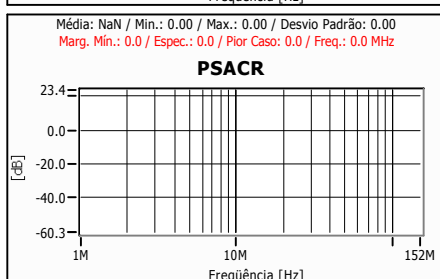
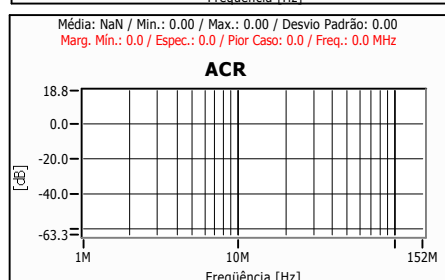
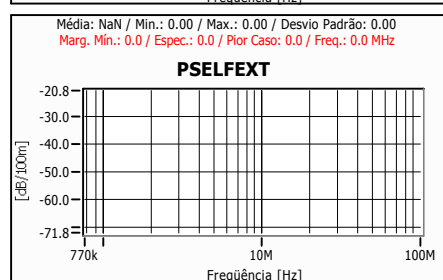
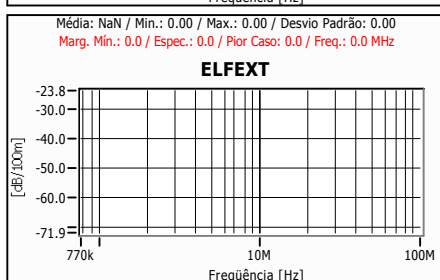
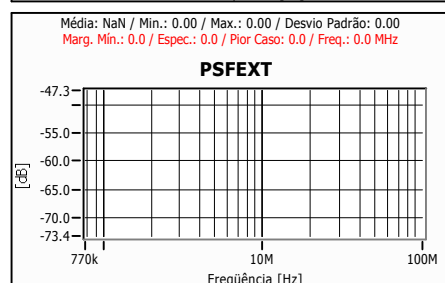
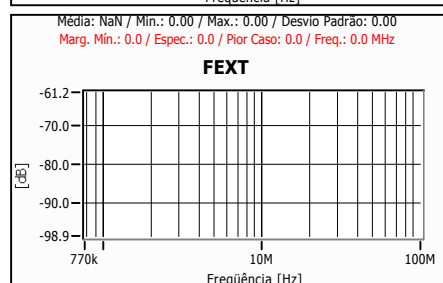
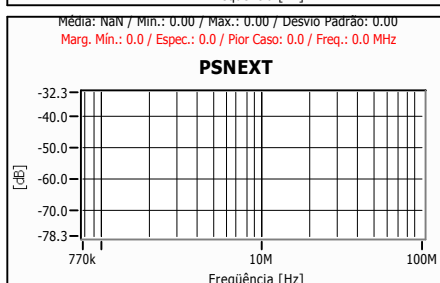
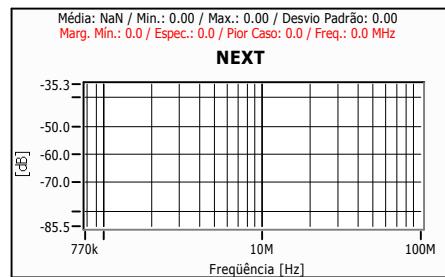
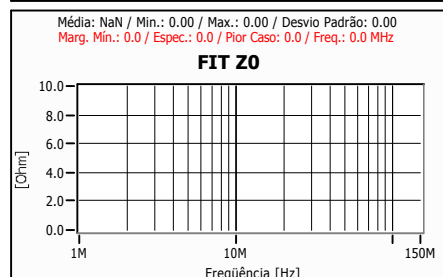
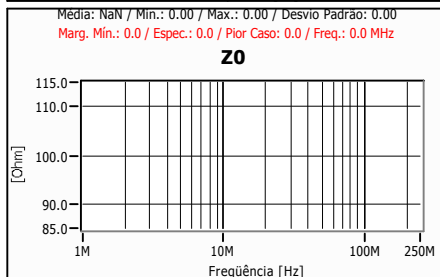
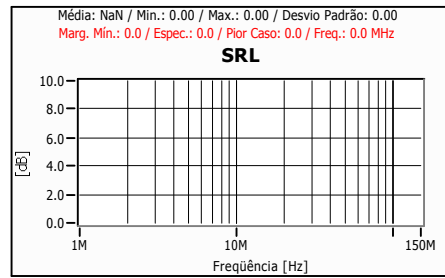
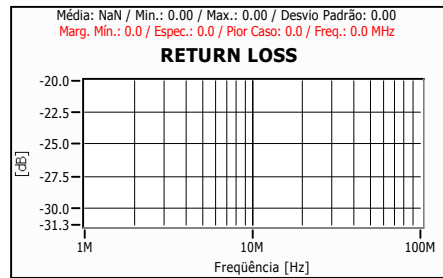
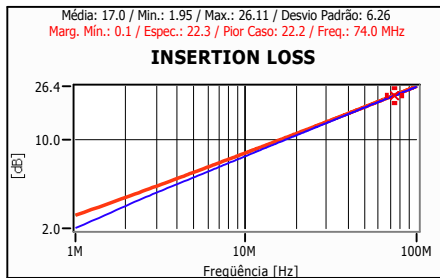
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Categoria	CAT5e_FLEX	Certificacao	SIM

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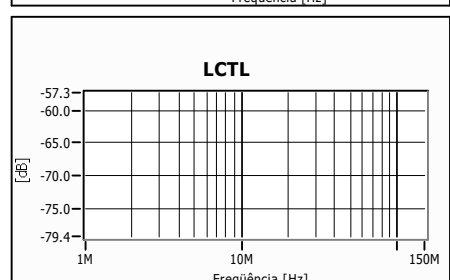
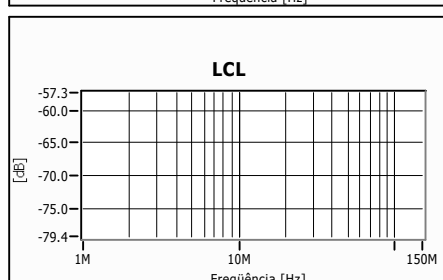
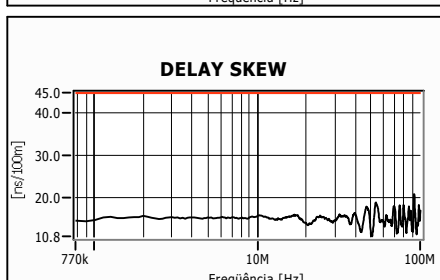
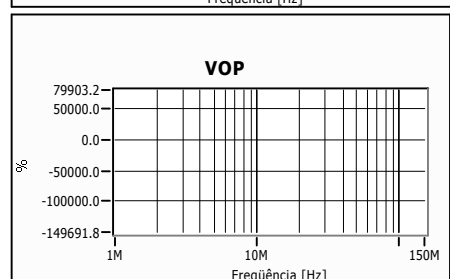
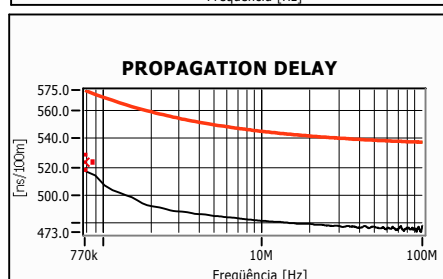
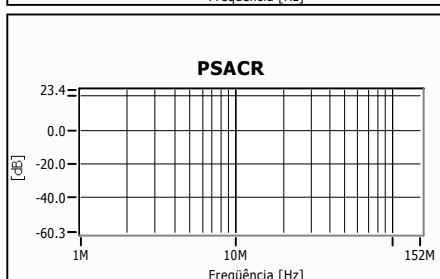
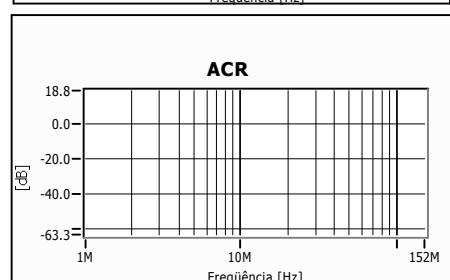
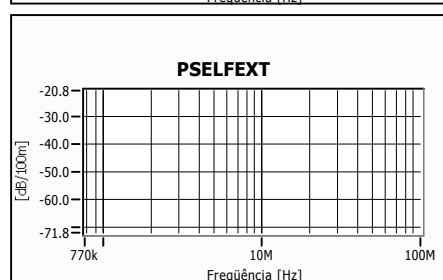
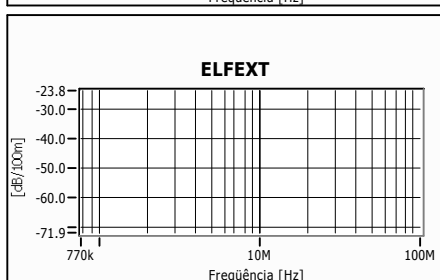
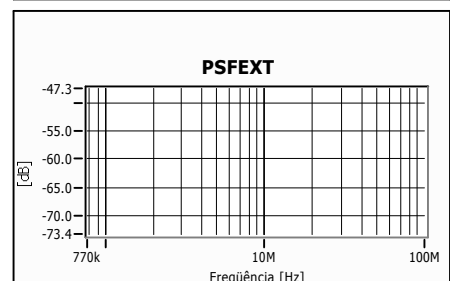
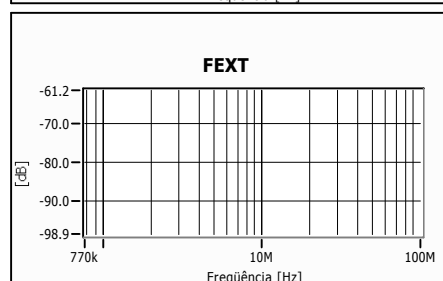
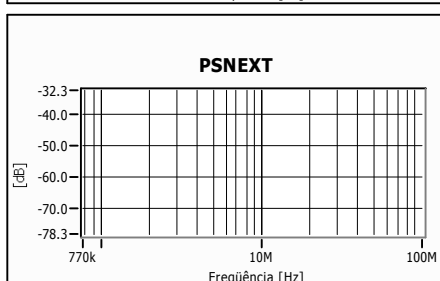
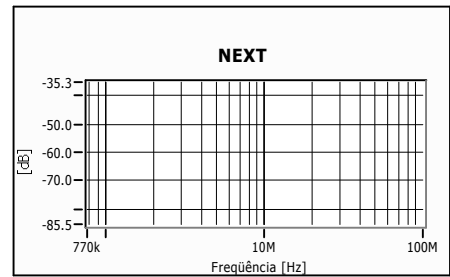
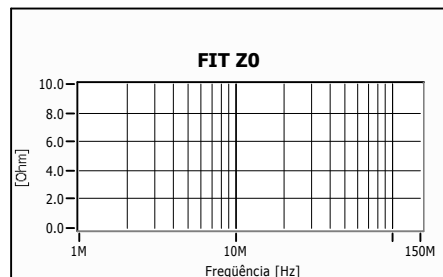
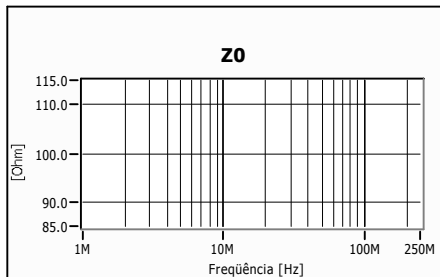
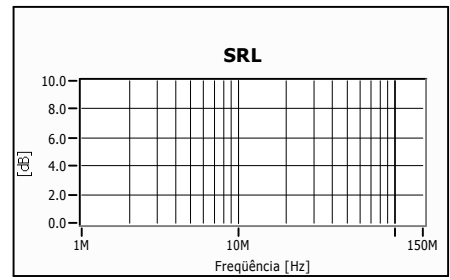
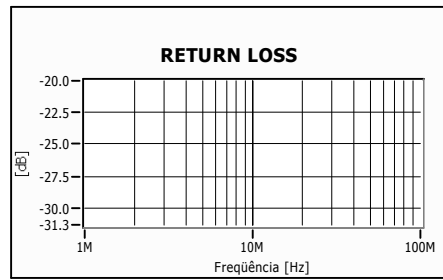
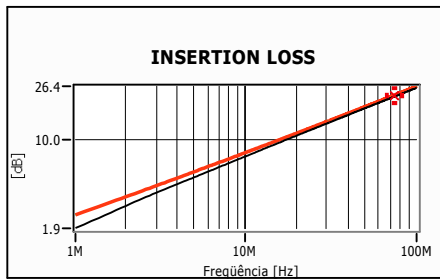
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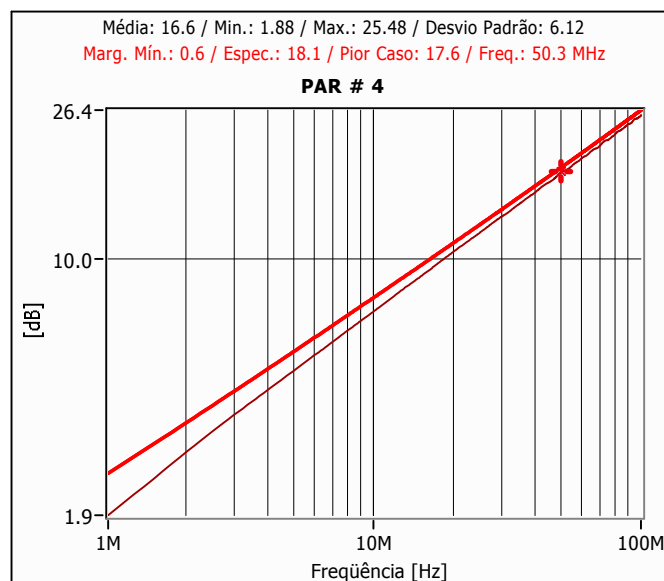
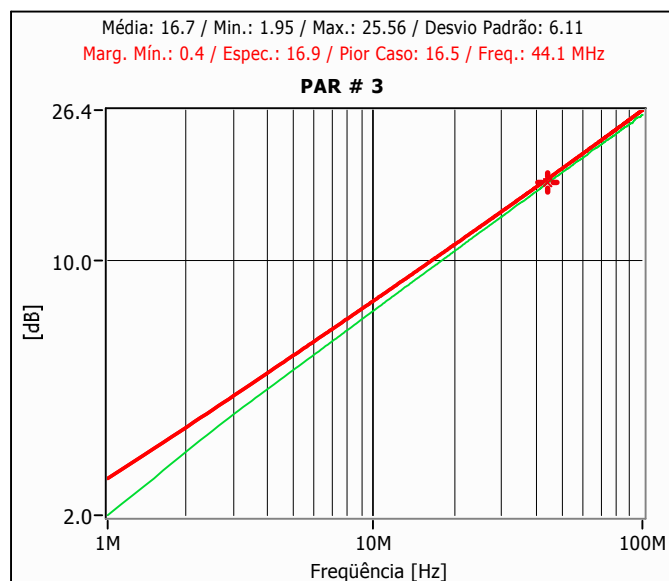
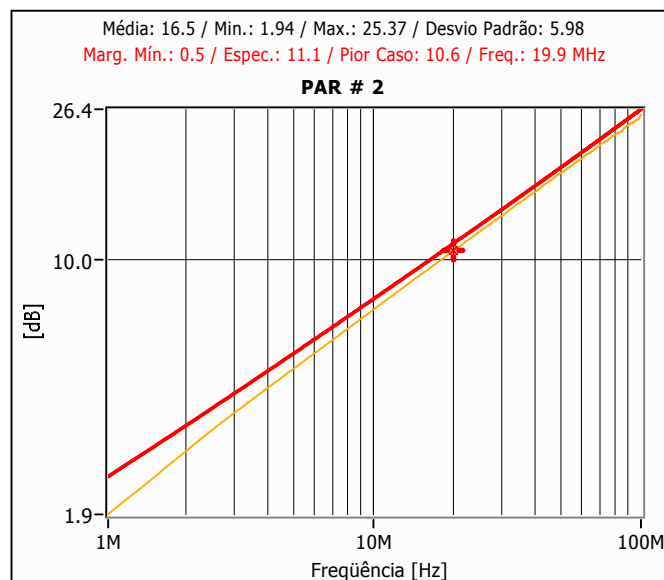
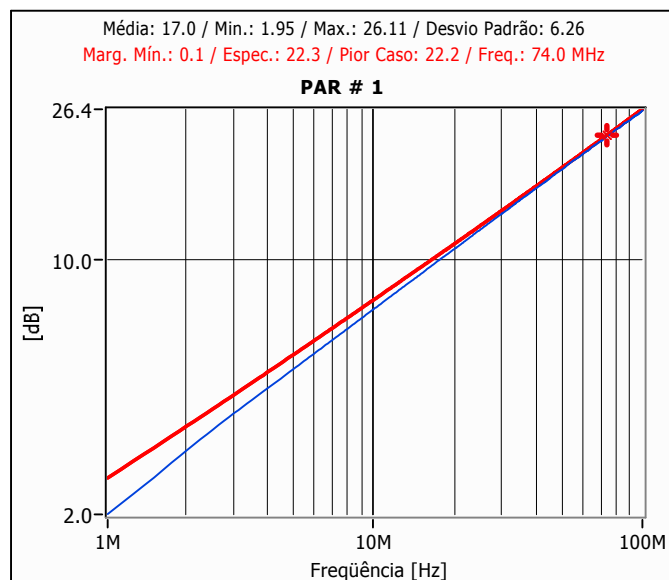
PIOR CASO



MÉDIAS

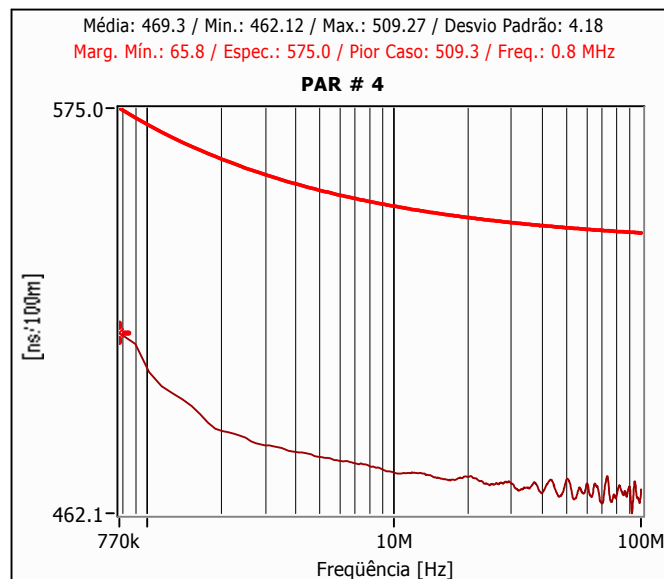
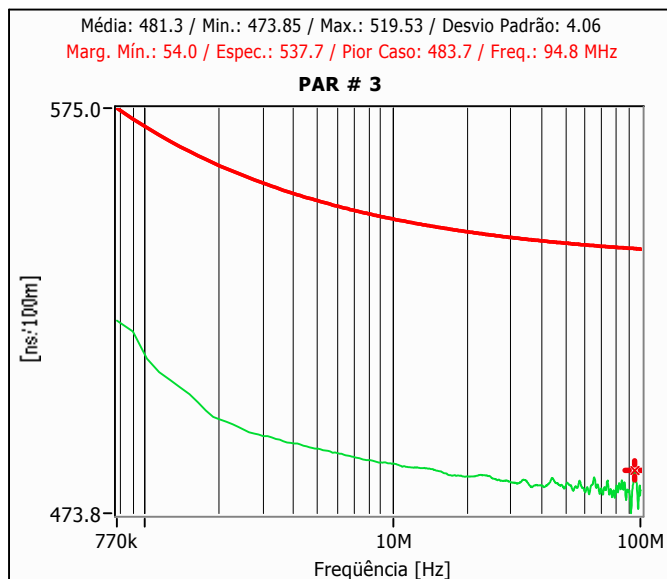
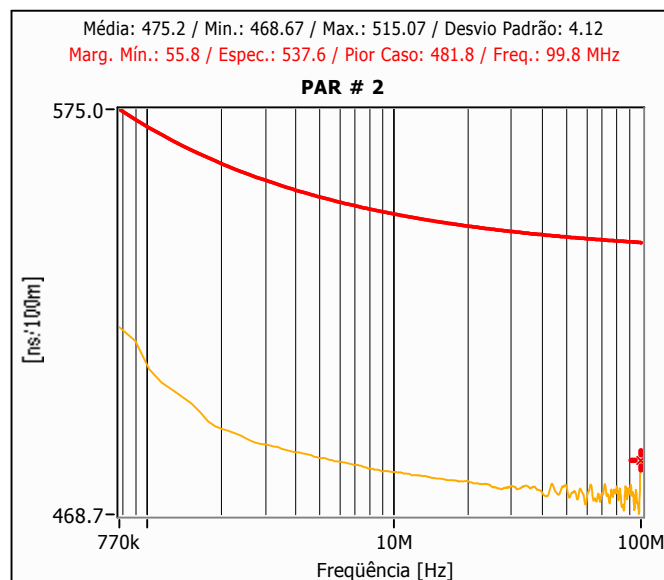
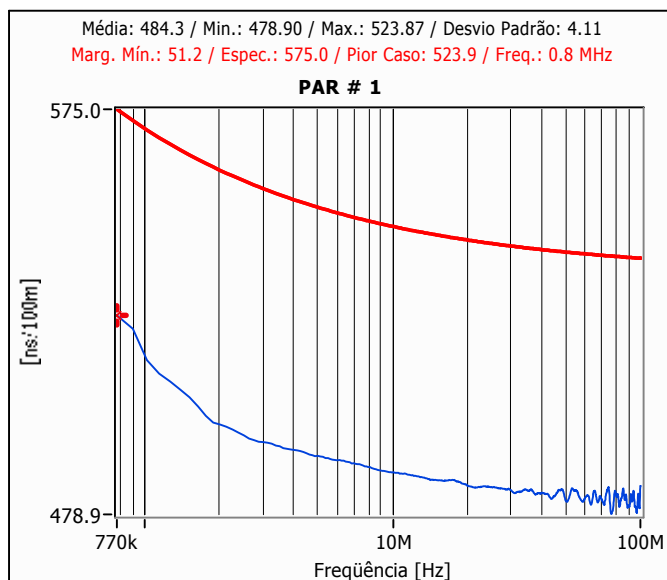


INSERTION LOSS



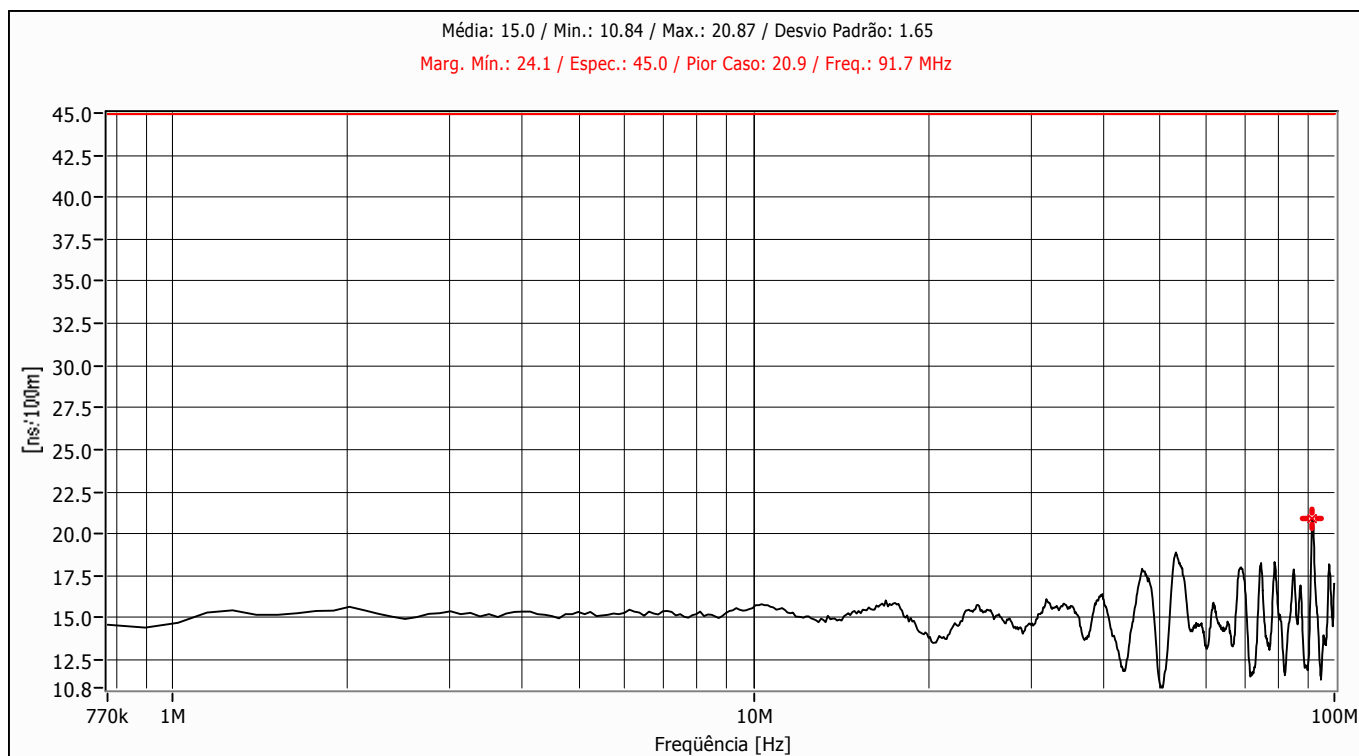
FREQ.	1	2	3	4	MIN.	MAX.	MÉDIA
1.00	1.95	1.94	1.95	1.88	1.88	1.95	1.93
4.00	4.38	4.35	4.38	4.24	4.24	4.38	4.34
8.00	6.43	6.39	6.42	6.24	6.24	6.43	6.37
10.00	7.29	7.23	7.26	7.07	7.07	7.29	7.21
16.00	9.52	9.40	9.44	9.25	9.25	9.52	9.40
20.00	10.76	10.63	10.66	10.51	10.51	10.76	10.64
25.00	12.18	11.97	12.06	11.86	11.86	12.18	12.02
31.25	13.79	13.53	13.62	13.41	13.41	13.79	13.58
62.50	20.18	19.68	19.84	19.63	19.63	20.18	19.82
100.00	26.14	25.35	25.57	25.50	25.35	26.14	25.63

PROPAGATION DELAY



FREQ.	1	2	3	4	MIN.	MAX.	MÉDIA
1.00	513.40	504.32	510.11	498.69	498.69	510.11	506.63
4.00	493.00	483.54	489.87	477.61	477.61	489.87	486.00
8.00	489.17	479.67	486.02	473.95	473.95	486.02	482.20
10.00	487.99	478.80	485.11	472.41	472.41	485.11	481.08
16.00	486.20	476.95	483.03	470.70	470.70	483.03	479.22
20.00	485.09	476.54	482.21	471.28	471.28	482.21	478.78
25.00	484.75	475.17	482.11	469.37	469.37	482.11	477.85
31.25	483.60	474.75	480.75	468.27	468.27	480.75	476.84
62.50	481.68	475.72	478.65	466.30	466.30	478.65	475.59
100.00	485.08	479.29	479.06	468.04	468.04	479.29	477.87

DELAY SKEW



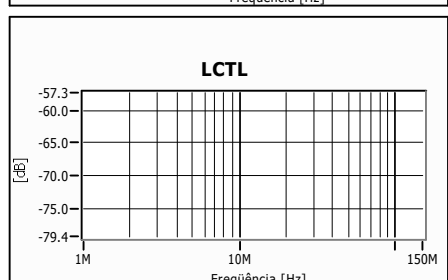
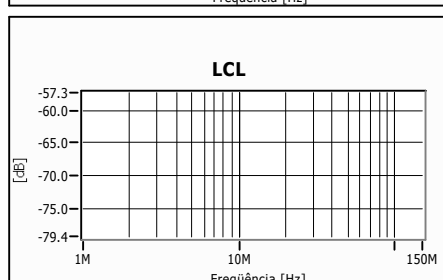
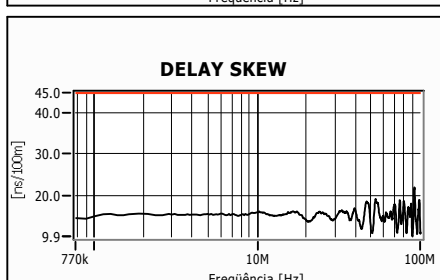
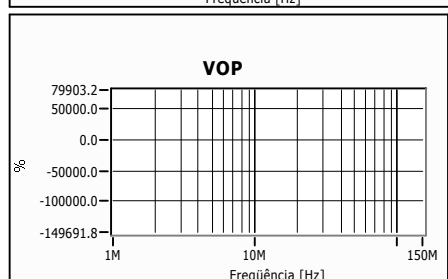
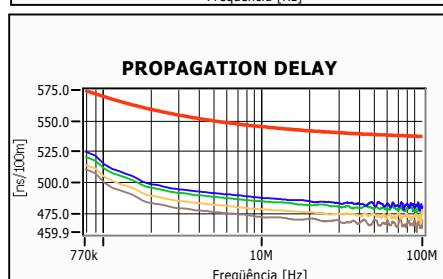
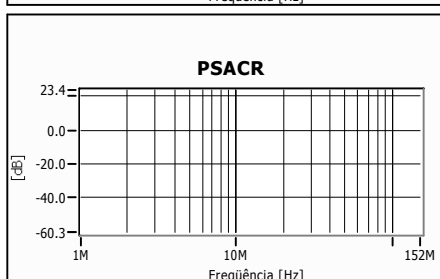
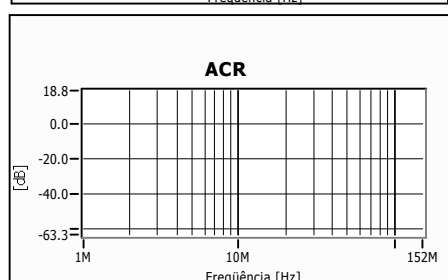
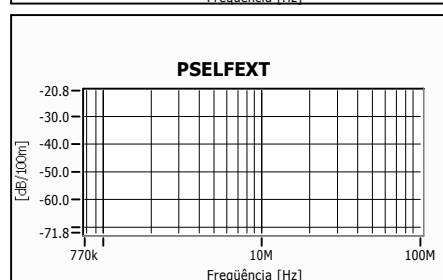
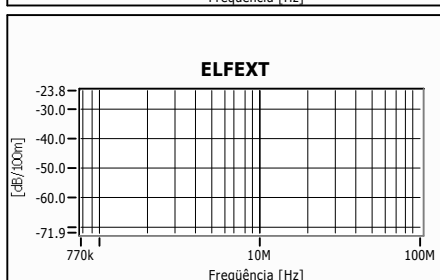
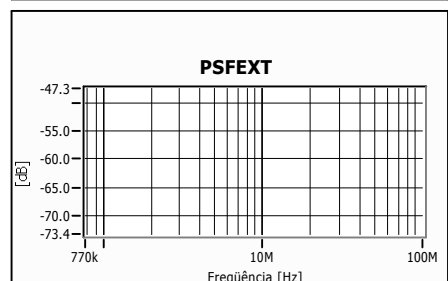
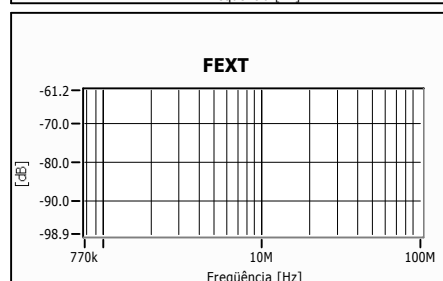
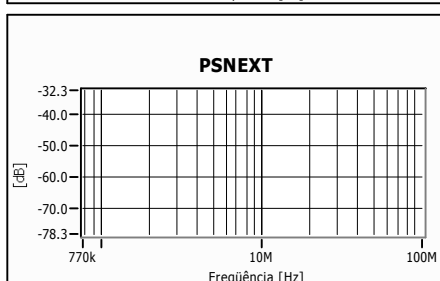
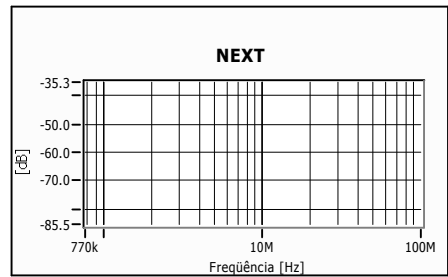
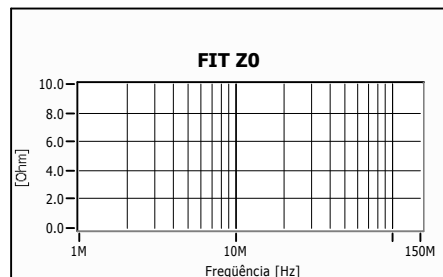
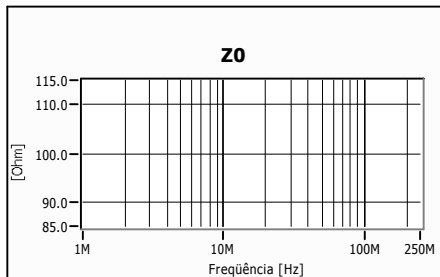
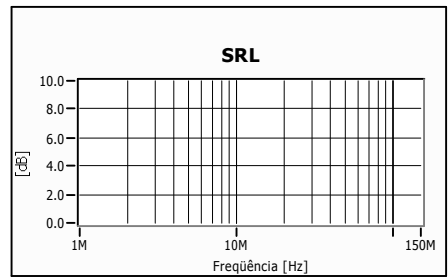
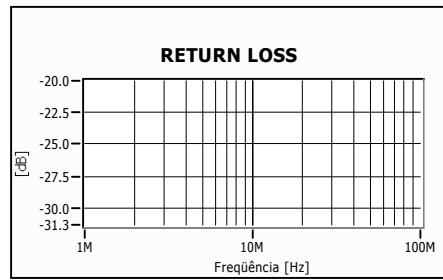
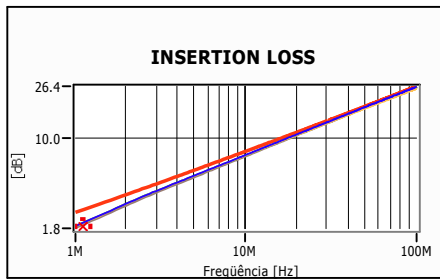
FREQ.	VALOR
1.00	14.72
4.00	15.39
8.00	15.23
10.00	15.59
16.00	15.50
20.00	13.81
25.00	15.39
31.25	15.32
62.50	15.38
100.00	17.04

CABEÇALHO

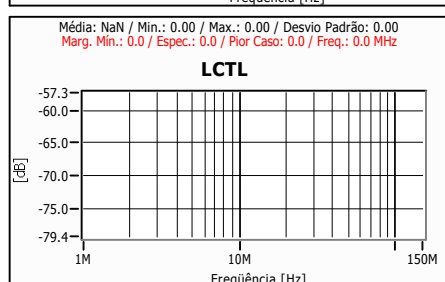
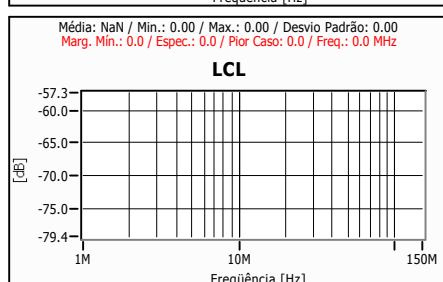
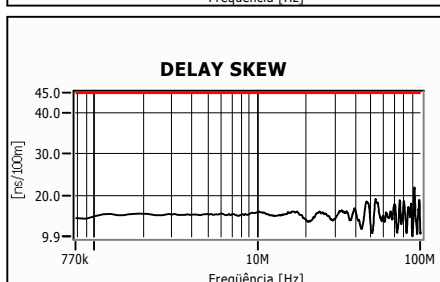
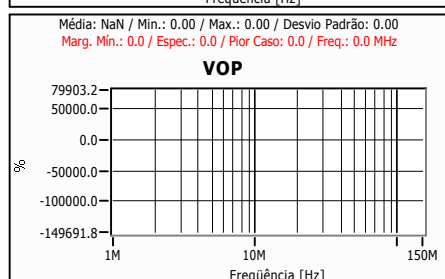
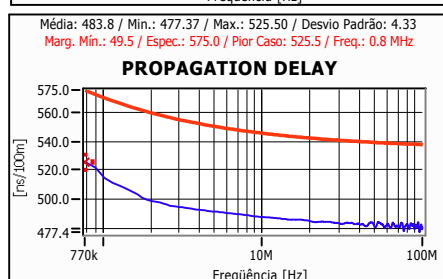
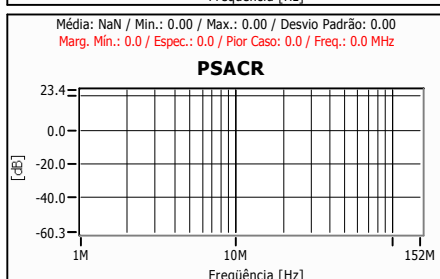
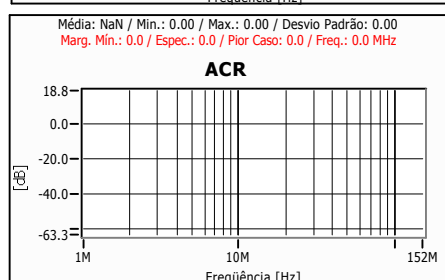
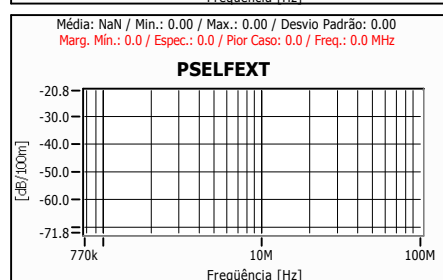
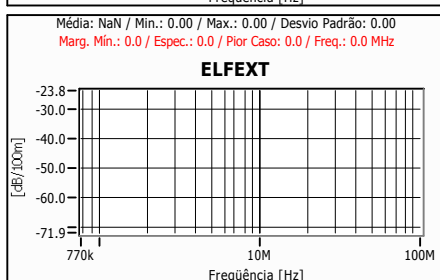
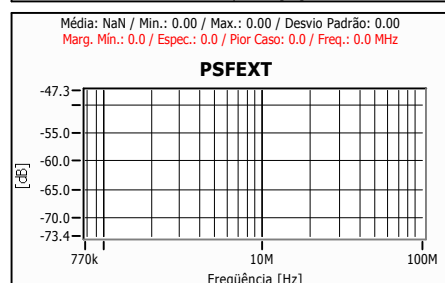
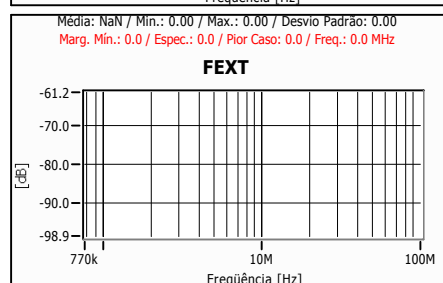
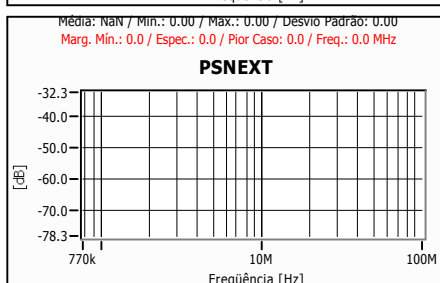
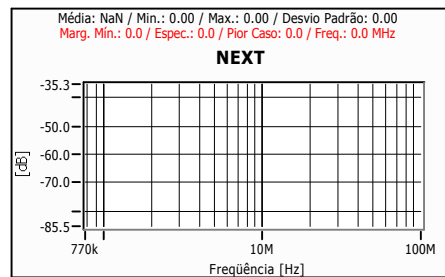
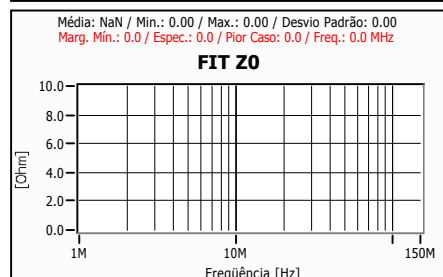
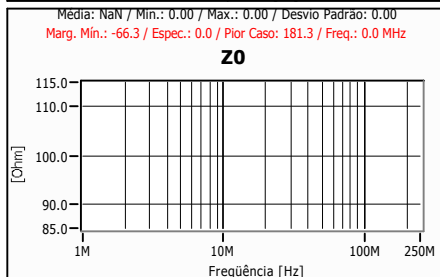
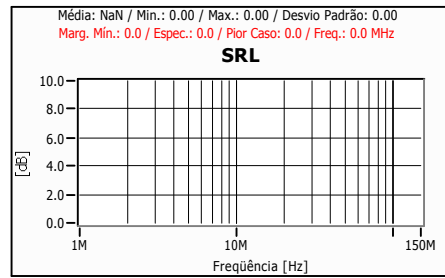
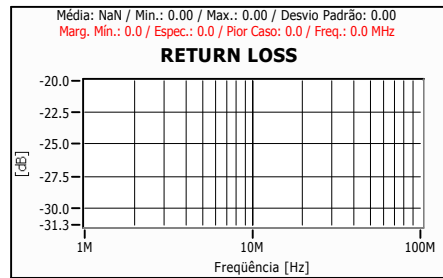
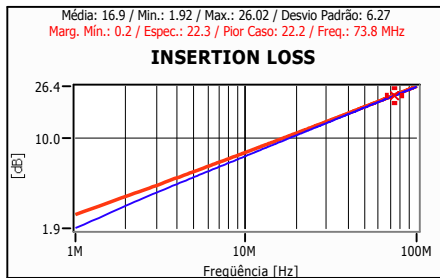
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Produto	Cabo Lan Categoria 5e Flexível	Data	19/2/2009
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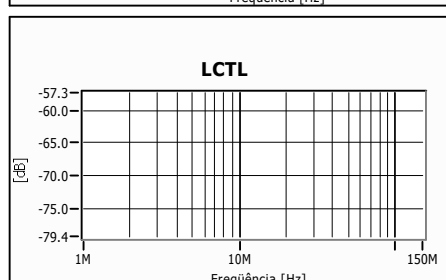
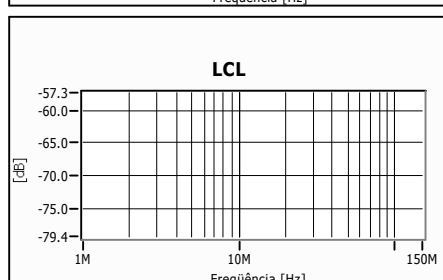
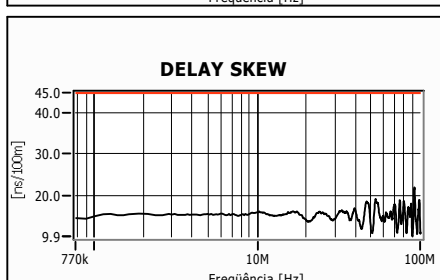
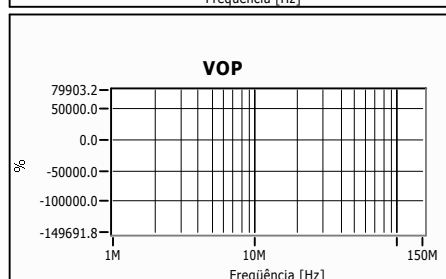
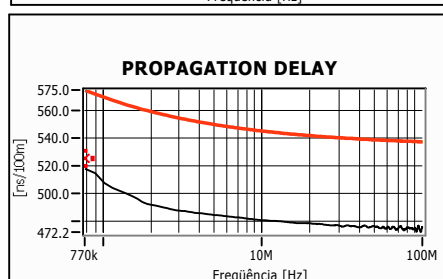
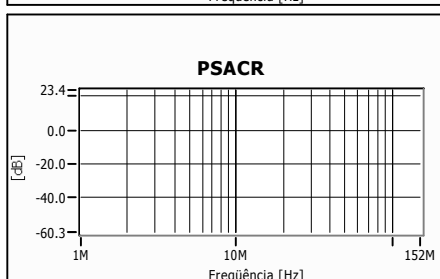
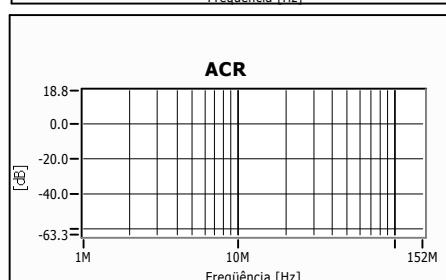
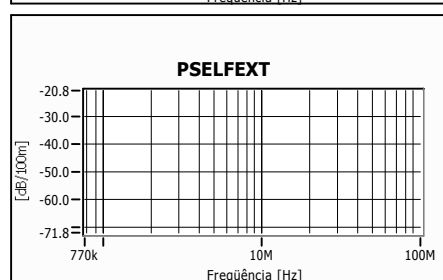
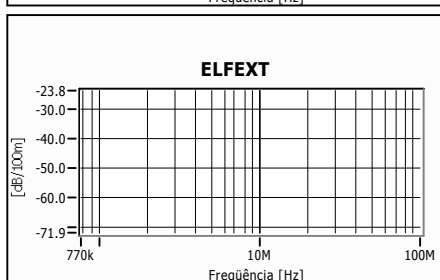
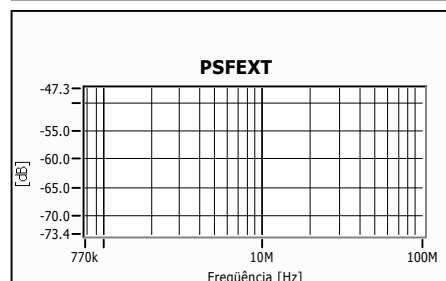
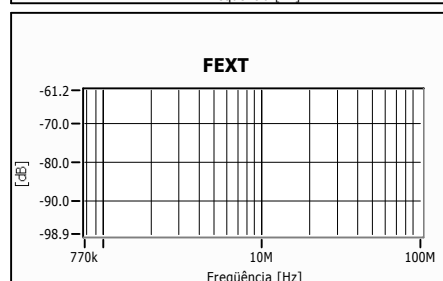
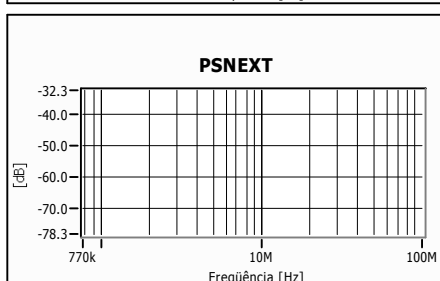
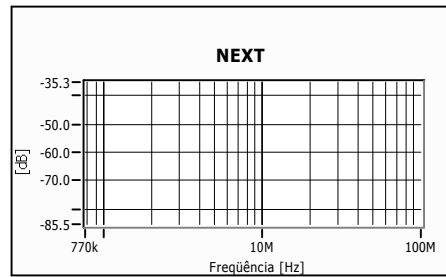
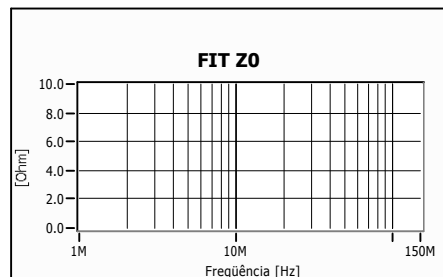
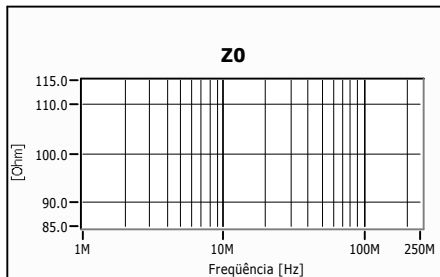
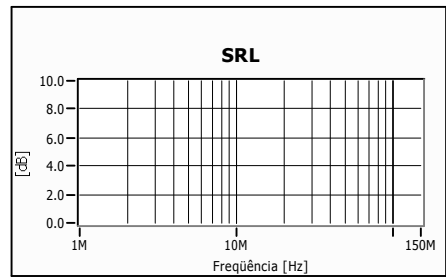
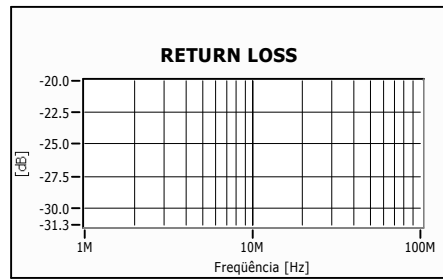
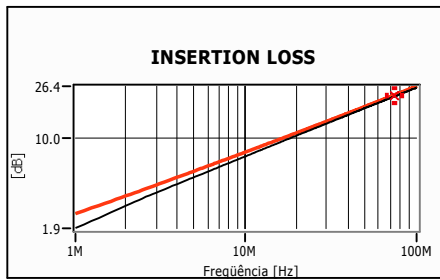
SUMÁRIO



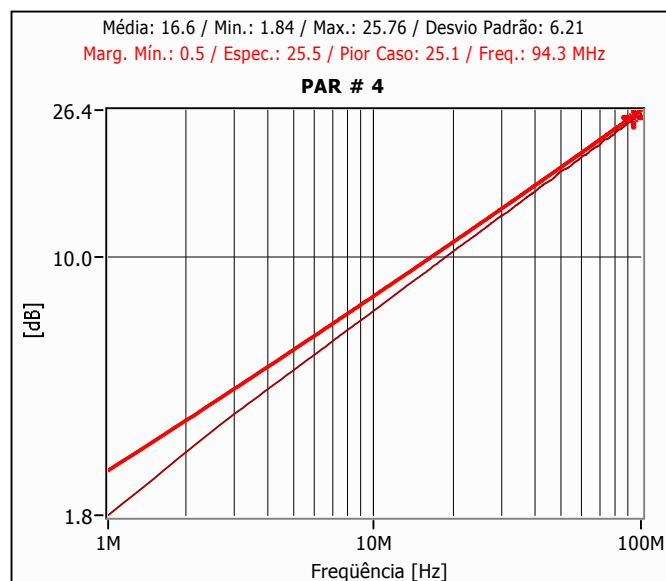
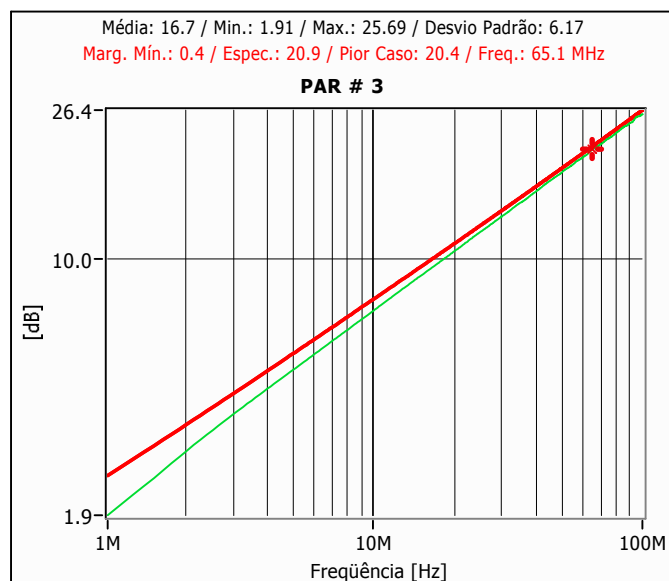
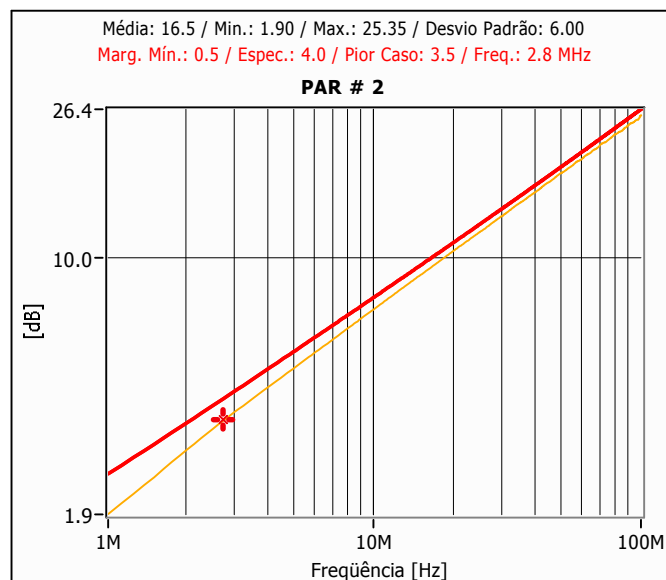
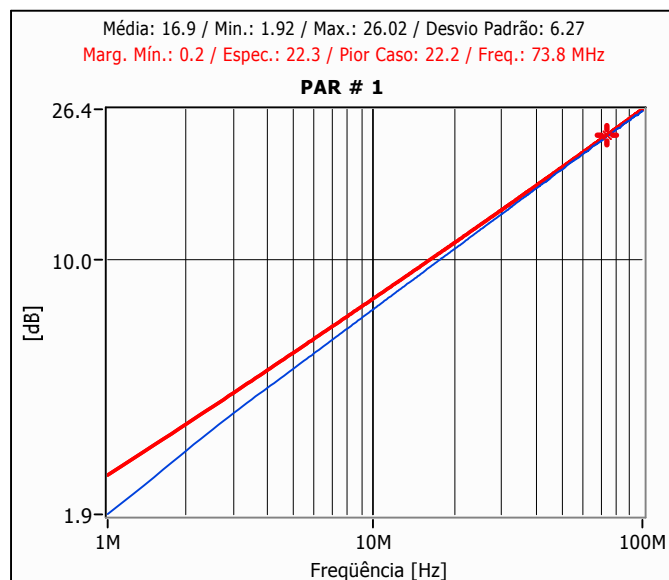
PIOR CASO



MÉDIAS

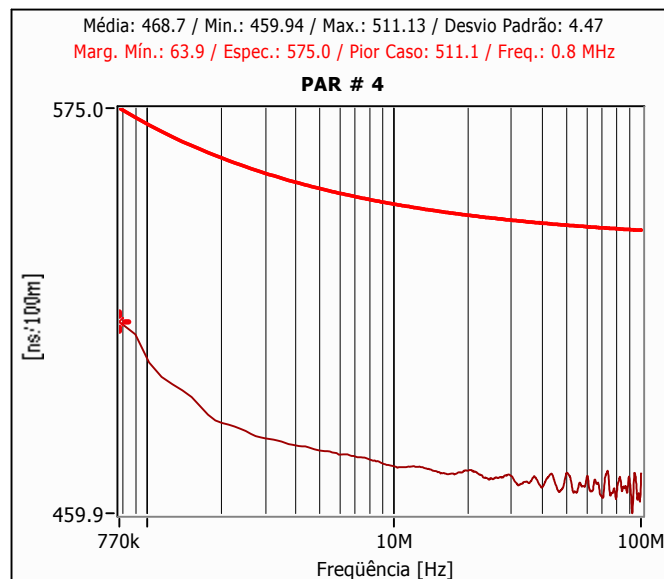
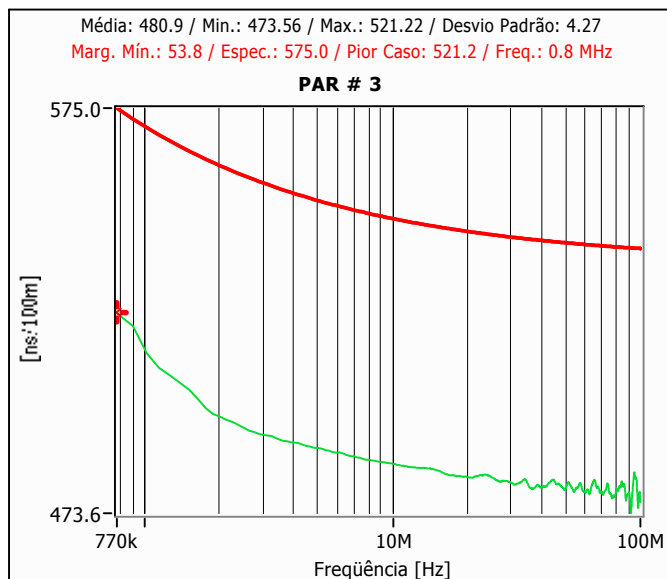
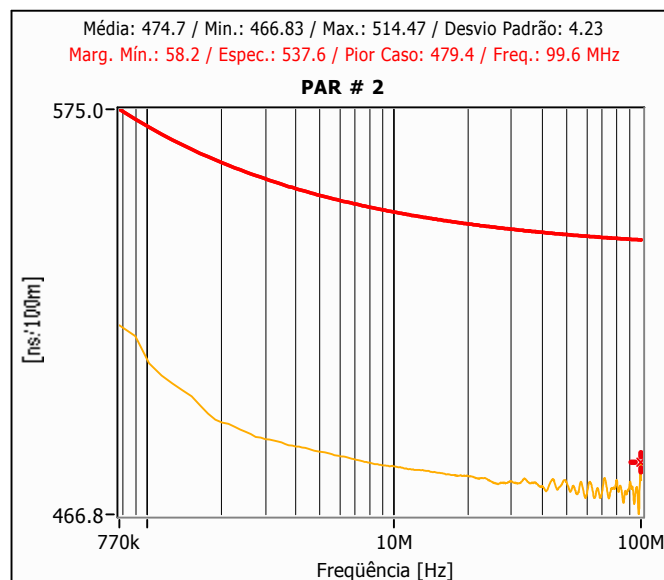
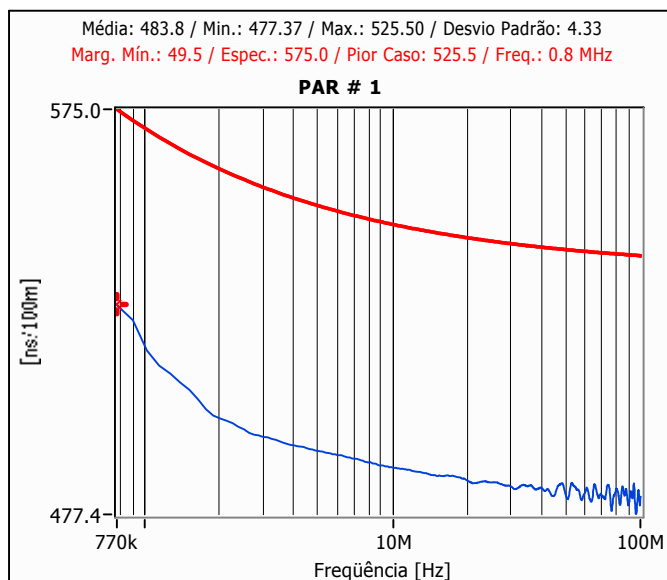


INSERTION LOSS



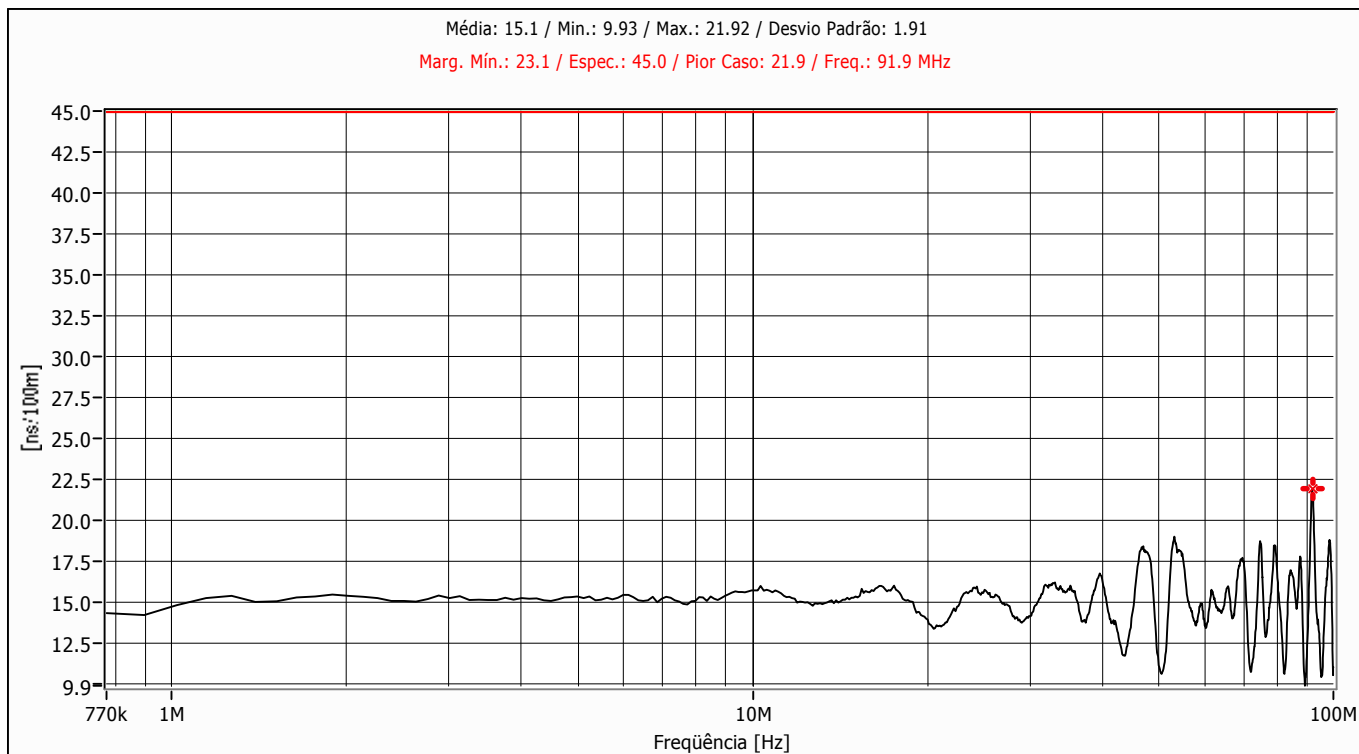
FREQ.	1	2	3	4	MIN.	MAX.	MÉDIA
1.00	1.92	1.90	1.91	1.84	1.84	1.92	1.89
4.00	4.33	4.31	4.32	4.19	4.19	4.33	4.29
8.00	6.37	6.33	6.35	6.20	6.20	6.37	6.31
10.00	7.22	7.16	7.19	7.02	7.02	7.22	7.15
16.00	9.44	9.32	9.37	9.21	9.21	9.44	9.33
20.00	10.68	10.54	10.59	10.47	10.47	10.68	10.57
25.00	12.10	11.87	11.98	11.83	11.83	12.10	11.95
31.25	13.70	13.43	13.55	13.41	13.41	13.70	13.52
62.50	20.11	19.58	19.86	19.73	19.58	20.11	19.82
100.00	26.05	25.34	25.71	25.80	25.34	26.05	25.72

PROPAGATION DELAY



FREQ.	1	2	3	4	MIN.	MAX.	MÉDIA
1.00	514.67	504.50	511.21	499.82	499.82	511.21	507.55
4.00	492.74	483.39	489.88	477.45	477.45	489.88	485.87
8.00	488.88	479.36	485.84	473.77	473.77	485.84	481.96
10.00	487.75	478.46	485.02	471.99	471.99	485.02	480.80
16.00	485.88	476.65	482.78	470.11	470.11	482.78	478.86
20.00	484.82	476.09	481.76	470.84	470.84	481.76	478.38
25.00	484.36	474.64	481.91	468.76	468.76	481.91	477.42
31.25	482.92	474.26	480.13	467.62	467.62	480.13	476.23
62.50	480.69	474.32	477.93	465.59	465.59	477.93	474.63
100.00	481.18	475.04	476.16	470.11	470.11	476.16	475.62

DELAY SKEW

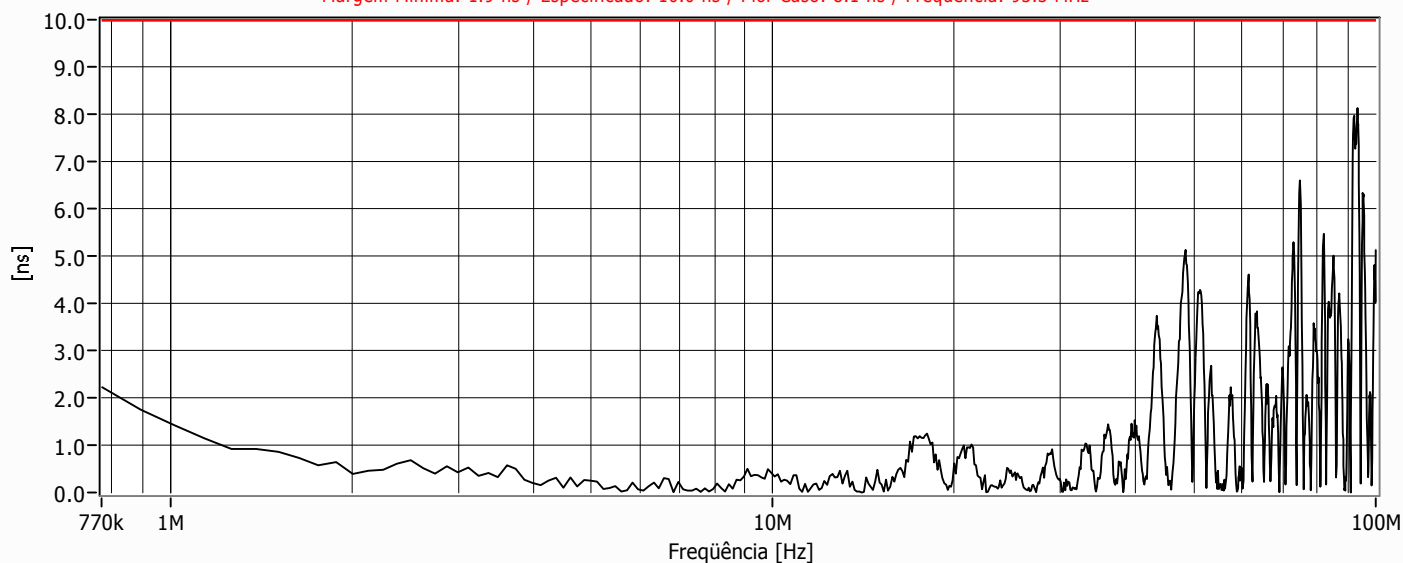


FREQ.	VALOR
1.00	14.85
4.00	15.29
8.00	15.10
10.00	15.76
16.00	15.77
20.00	13.98
25.00	15.60
31.25	15.30
62.50	15.10
100.00	11.07

DIFERENÇA ENTRE AS DIFERENÇAS DOS ATRASOS DE PROPAGAÇÃO DE 20°C PARA 40°C E 60°C

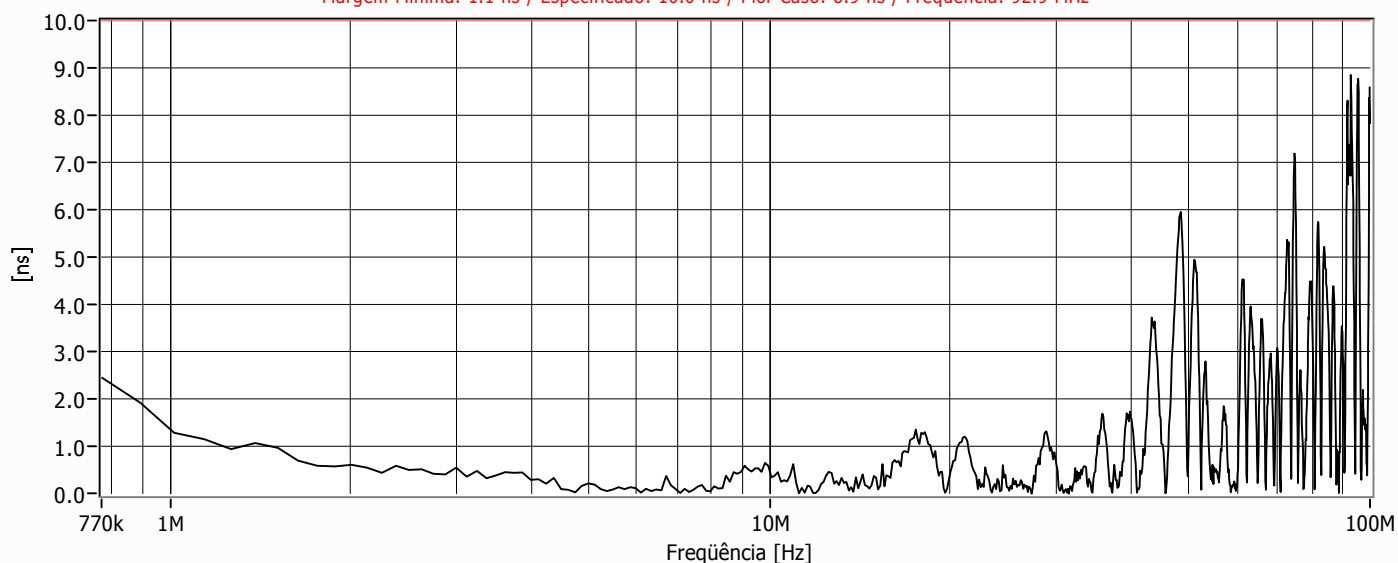
DIFERENÇA ENTRE 20°C E 40°C

Margem Mínima: 1.9 ns / Especificado: 10.0 ns / Pior Caso: 8.1 ns / Frequência: 93.3 MHz



DIFERENÇA ENTRE 20°C E 60°C

Margem Mínima: 1.1 ns / Especificado: 10.0 ns / Pior Caso: 8.9 ns / Frequência: 92.9 MHz



FREQ. [MHz]	DIFERENÇA 20°C / 40°C [ns]	DIFERENÇA 20°C / 60°C [ns]
1.00	1.42	1.29
4.00	0.20	0.29
8.00	0.08	0.05
10.00	0.41	0.58
16.00	0.38	0.66
20.00	0.62	0.45
25.00	0.34	0.13
31.25	0.05	0.02
62.50	1.02	1.30
100.00	5.14	8.61