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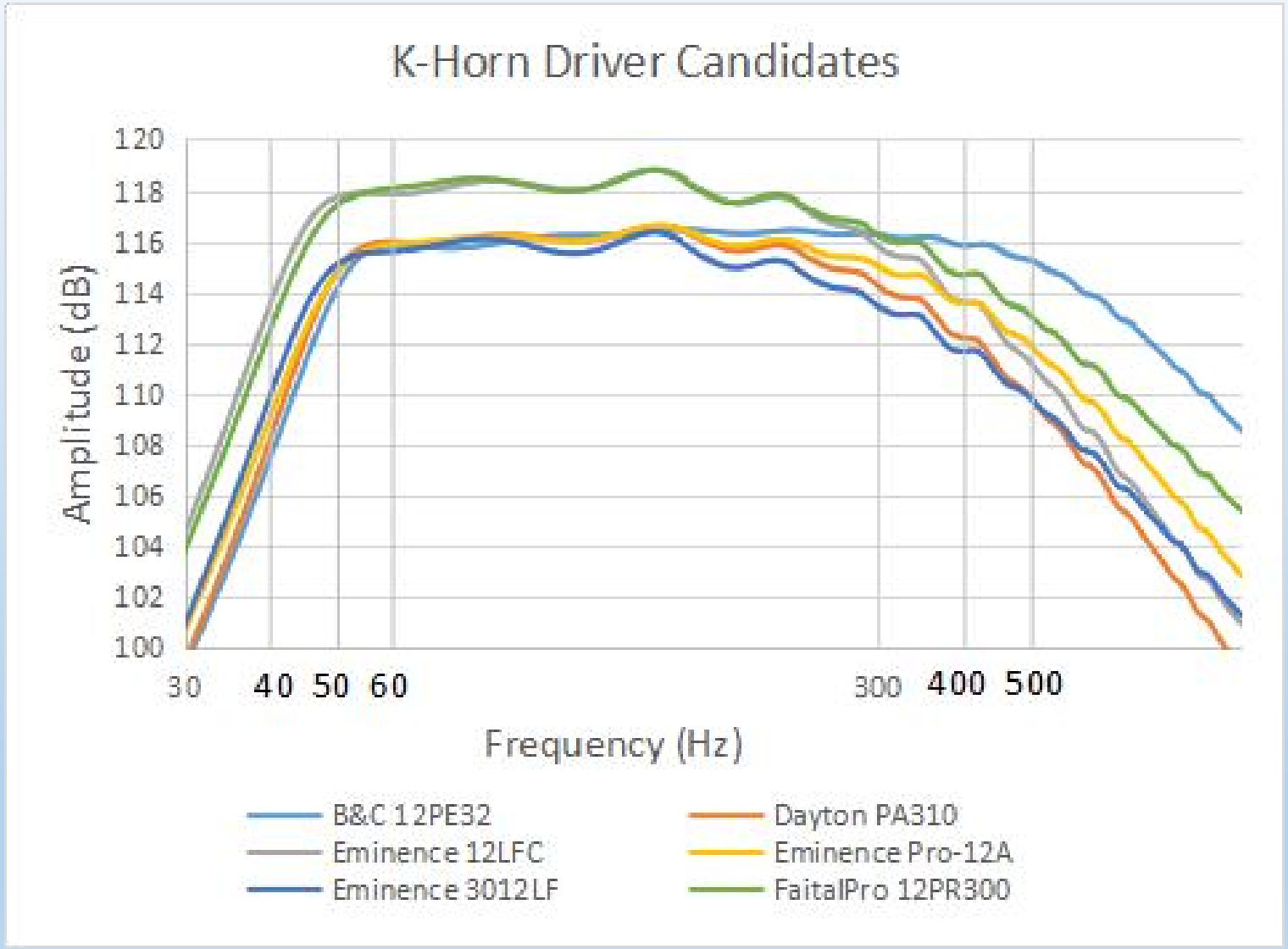
Driver Candidates Using Exponential and High Initial Flares

This first section makes use of exponential flares

Parameters for modeling each horn shape. Note that the horn throat size was dictated by using the method proposed by Keele (Low Frequency Horn Design by Using Thiele/Small Parameters).

Driver	Sd	Ratio	S1	S2	L1	Effective Exponential Flare1
B&C 12PE32 - 50Hz	522	3.08	169.5	2028	172.4	39.42
Dayton Audio PA310-8 - 39Hz	531	2.79	190.1	2028	172.4	37.59
Eminence Delta 12LFC - 52Hz	507	1.90	267.1	2028	172.4	32.19
Eminence Kappa Pro-12A - 37Hz	520	2.64	196.7	2028	172.4	37.05
Eminence Kappalite 3012LF Neo - 37Hz	545	2.39	227.7	2028	172.4	34.73
FaitalPRO 12PR300 12 - 50Hz	489	2.11	231.4	2028	172.4	34.47
Electro Voice 15L	855	1.86	459.2	4056.1	172.4	34.6
Eminence Kappa 15C - 31Hz	856	1.83	468.4	4056.1	172.4	34.28
Klipsch K-33 Round	889	2.18	407	4056.1	172.4	36.51

If one is looking for a wider bandwidth driver than the K-33, and doesn't mind an fc of 50, then the B&C 12PE32 is an excellent choice.

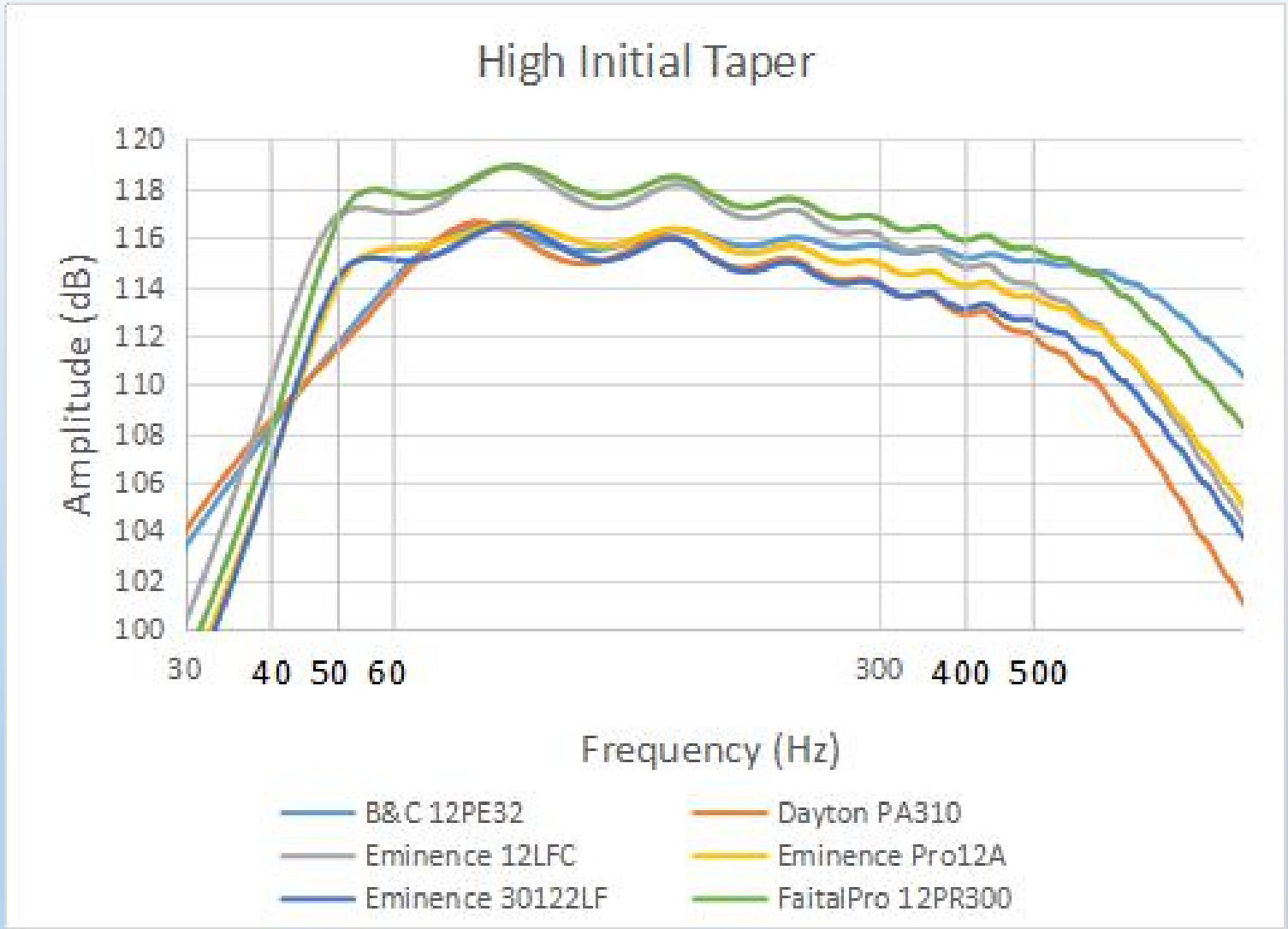


Driver Candidates Using High Initial Flare

Note the extremely small throat size. All high initial flare rates are equivalent to 100 Hz, even though the flare is conical in nature.

						Effective Exponential			
Driver	Sd	Ratio	S1	S2	L1	Flare1	S3	Exp	Flare2
B&C 12PE32 - 50Hz (100Hz Initial Flare)	522	5.8	90	187	20	100.11	2028.05	152.4	42.82
Dayton Audio PA310-8 - 39Hz (100Hz Ini	531	5.9	90	187	20	100.11	2028.05	152.4	42.82
Eminence Delta 12LFC - 52Hz - (100Hz Ir	507	5.63	90	187	20	100.11	2028.05	152.4	42.82
Eminence Kappa Pro-12A - 37Hz - (100H	520	5.78	90	187	20	100.11	2028.05	152.4	42.82
Eminence Kappalite 3012LF Neo - 37Hz -	545	6.06	90	187	20	100.11	2028.05	152.4	42.82
FaitalPRO 12PR300 12 - 50Hz - (100Hz Ir	489	5.43	90	187	20	100.11	2028.05	152.4	42.82

For a throat size this small, there does not seem to be an advantage in using a high initial taper.



Initial Driver Selection - Eminence Delta 12LFC

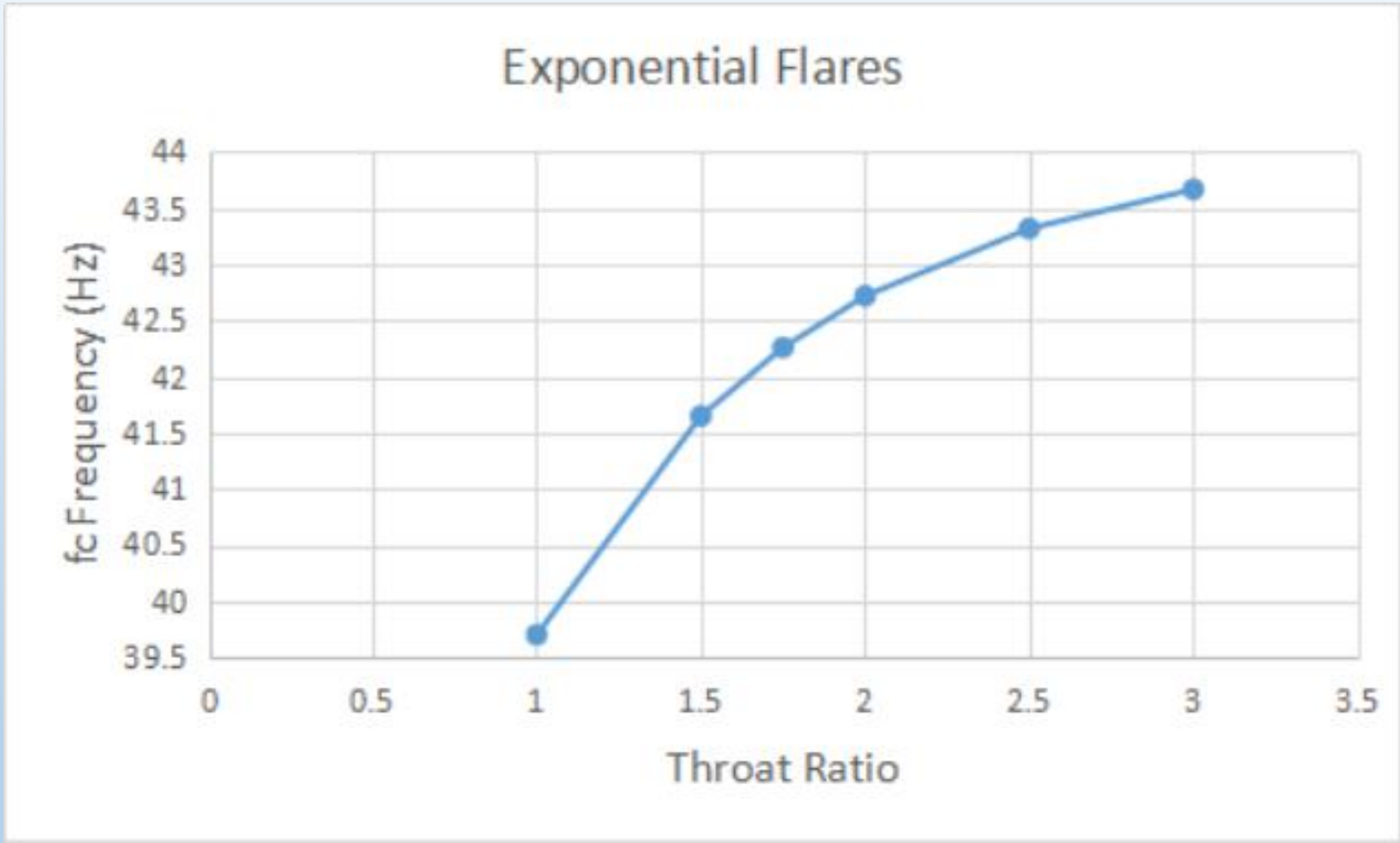
Horn parameters, exponential and high initial taper.

						Effective Exponential			
Driver	Sd	Ratio	S1	S2	L1	Flare1	S3	Exp	Flare2
Eminence Delta 12LFC - 52Hz Chan	507	1	507	2028	172.4	22.02			
Eminence Delta 12LFC - 52Hz Chan	507	1.5	339	2028	172.4	28.41			
Eminence Delta 12LFC - 52Hz Chan	507	1.75	290	2028	172.4	30.89			
Eminence Delta 12LFC - 52Hz Chan	507	2	254	2028	172.4	32.99			
Eminence Delta 12LFC - 52Hz Chan	507	2.5	203	2028	172.4	36.55			
Eminence Delta 12LFC - 52Hz Chan	507	3	169	2028	172.4	39.46			
Eminence Delta 12LFC - 52Hz	507	3	169	244	20	50.28	2028.05	152.4	38.04
Eminence Delta 12LFC - 52Hz	507	3	169	292	20	74.86	2028.05	152.4	34.82
Eminence Delta 12LFC - 52Hz	507	3	169	351	20	100.05	2028.05	152.4	31.51
Eminence Delta 12LFC - 52Hz	507	3	169	421	20	124.95	2028.05	152.4	28.24

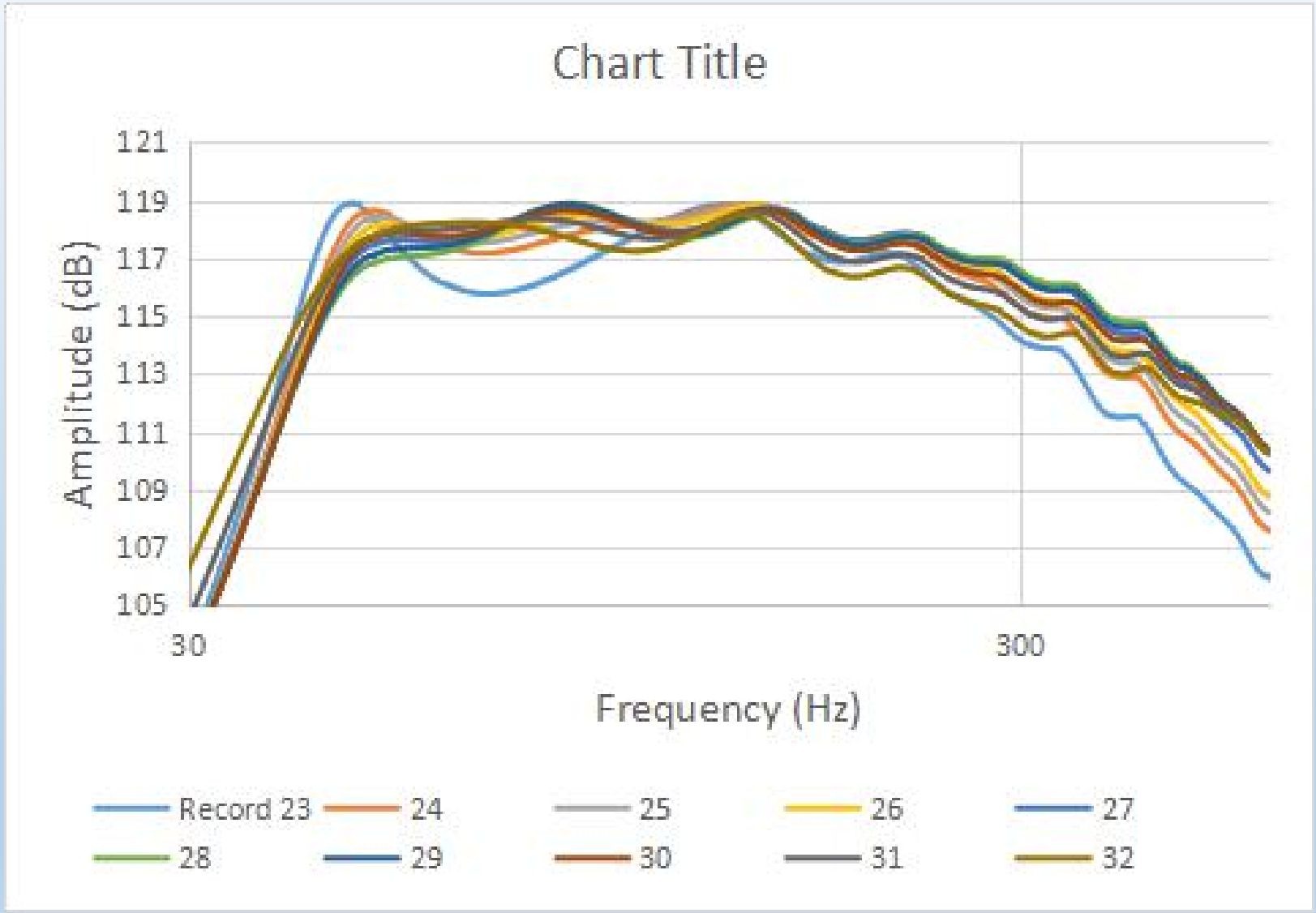
Here is the corresponding data for bandwidth, etc.

Driver	LowEnd	HiEnd	Ripple	Eff	Vrc	Record	Octaves
Eminence Delta 12LFC - 52Hz Chan	39.7	306.98	3.141	117	30	23	2.951
Eminence Delta 12LFC - 52Hz Chan	41.65	344.81	1.471	117.7	30	24	3.049
Eminence Delta 12LFC - 52Hz Chan	42.26	352.27	1.29	117.9	30	25	3.059
Eminence Delta 12LFC - 52Hz Chan	42.72	358.42	1.208	117.9	30	26	3.069
Eminence Delta 12LFC - 52Hz Chan	43.32	370.86	1.125	118	30	27	3.098
Eminence Delta 12LFC - 52Hz Chan	43.67	389.05	1.203	117.9	25	28	3.155
Eminence Delta 12LFC - 52Hz	43.42	380.96	1.179	117.8	30	29	3.133
Eminence Delta 12LFC - 52Hz	42.97	368.54	1.42	117.8	30	30	3.100
Eminence Delta 12LFC - 52Hz	41.27	364.52	1.763	117.5	40	31	3.143
Eminence Delta 12LFC - 52Hz	39.71	357.62	2.136	117.2	60	32	3.171

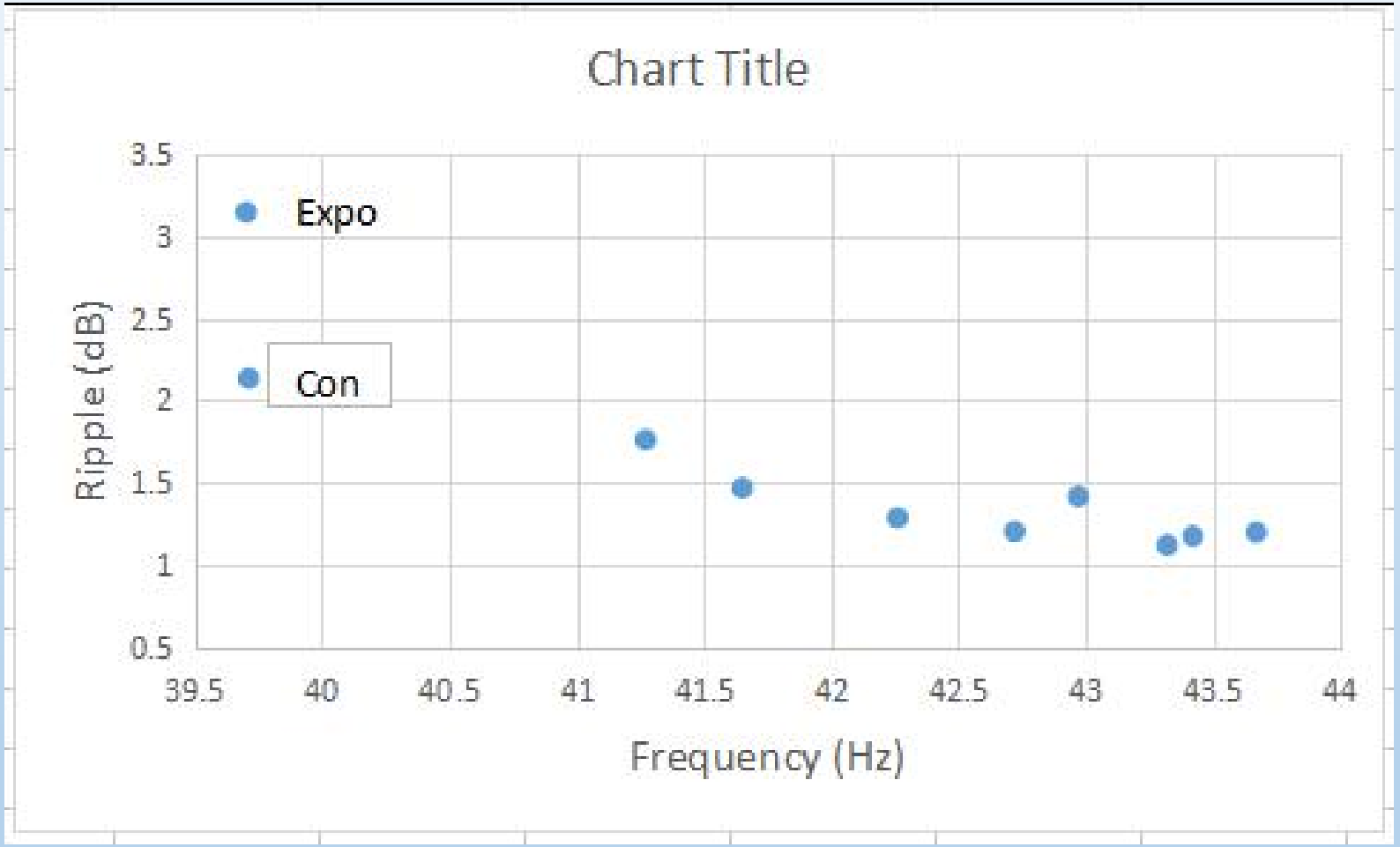
The relation for Sd/S1 (ratio) and fc is shown on right.



Amplitude response of the various horn shapes, using the same driver. The record number data is shown on slides #6 and #7.



Shows the relation between low end fc and Ripple. Reducing band pass ripple seems to be the advantage of utilizing a high initial flare rate, since it does not lower the fc much.



Modeling a Horn Shape with All Drivers

An exponential horn with a Sd/S1 ratio of 3.0 was selected and maintained for each size driver piston area.

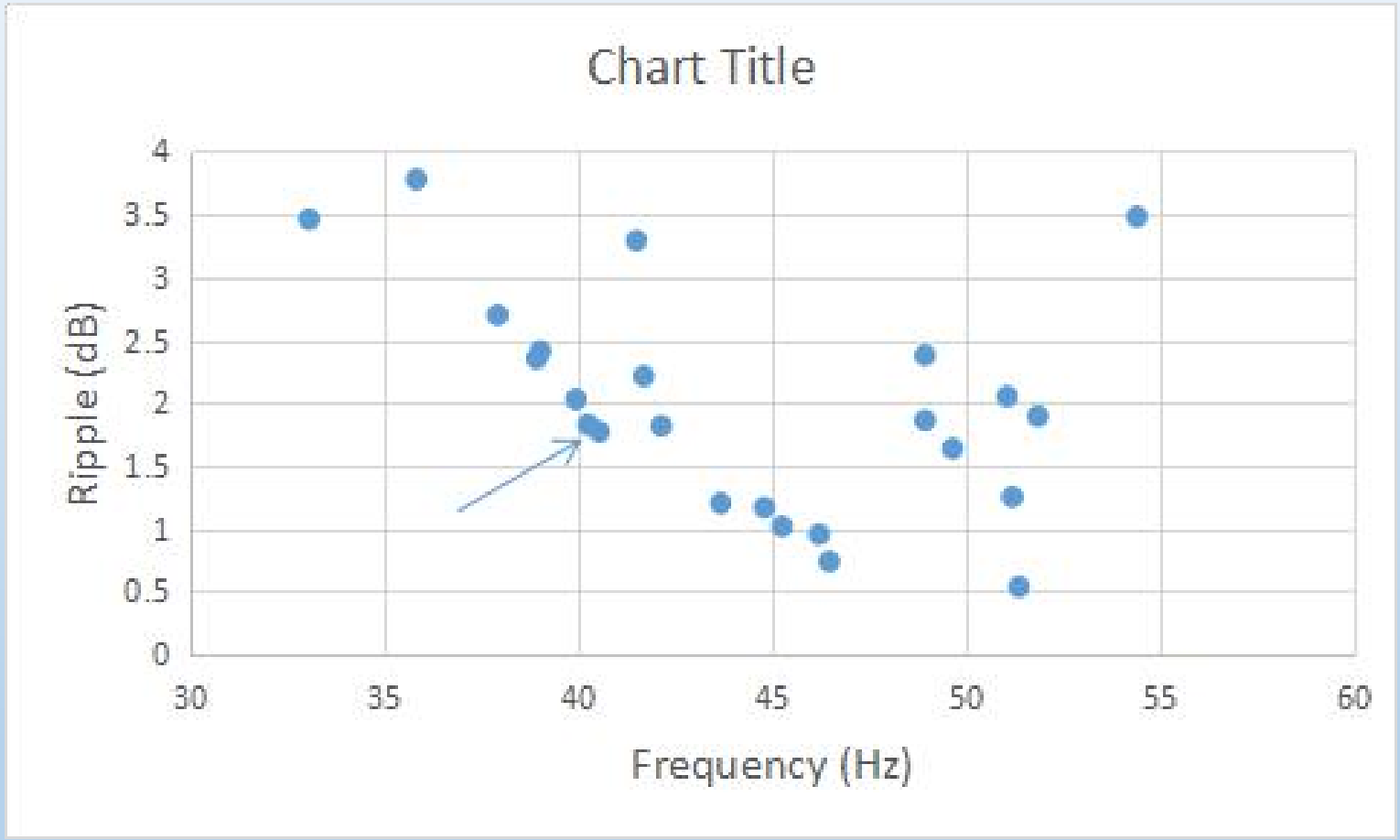
Modeling parameters for each driver are shown to right. The two drivers highlighted are two excellent candidates for a corner horn.

						Effective Exponential			
Driver	Sd	Ratio	S1	S2	L1	Flare1	S3	Exp	Flare2
B&C 12BG100 - 39	522	3	174	2028	172.4	39			
B&C 12NBX100 - 41Hz	531	3	177	2028	172.4	38.73			
B&C 12NW76 - 40Hz	522	3	174	2028	172.4	39			
B&C 12PE32 - 50Hz	522	3	174	2028	172.4	39			
B&C 12PS100 - 44Hz	531	3	177	2028	172.4	38.73			
B&C 12TBX100 - 42Hz	531	3	177	2028	172.4	38.73			
B&C PS76 - 42Hz	522	3	174	2028	172.4	39			
Beyma 12BR70 - 31Hz	520	3	173.3	2028	172.4	39.06			
Caire HW321 - 27Hz	535	3	178.3	2028	172.4	38.61			
Dayton Audio PA310-8 - 39Hz	531	3	177	2028	172.4	38.73			
Eminence Alpha 12A - 49Hz	520	3	173.3	2028	172.4	39.06			
Eminence Beta 12A-II - 47Hz	539	3	179.6	2028	172.4	38.5			
Eminence Beta 12LTA - 45Hz	532	3	177.3	2028	172.4	38.7			
Eminence Definimax 4012 - 40Hz	520	3	173.3	2028	172.4	39.06			
Eminence Delta 12LFC - 52Hz	507	3	169	2028	172.4	39.46			
Eminence Delta Pro 12-450A - 44	532	3	177.3	2028	172.4	38.7			
Eminence Deltalite II 2512 - 44Hz	520	3	173.3	2028	172.4	39.06			
Eminence Kappa Pro-12A - 37Hz	520	3	173.3	2028	172.4	39.06			
Eminence Kappalite 3012LF Neo -	545	3	181.6	2028	172.4	38.32			
Eminence Lab 12 - 22Hz	520	3	173.3	2028	172.4	39.06			
Eminence Legend BP122 - 35Hz	532	3	177.3	2028	172.4	38.7			
FaitalPRO 12PR300 12 - 50Hz	489	3	163	2028	172.4	40.04			
Goldwood GW-1238-PA-12 - 44Hz	523	3	174.3	2028	172.4	38.97			
Goldwood GW-1258-12 - 42Hz	586	3	195.3	2028	172.4	37.17			

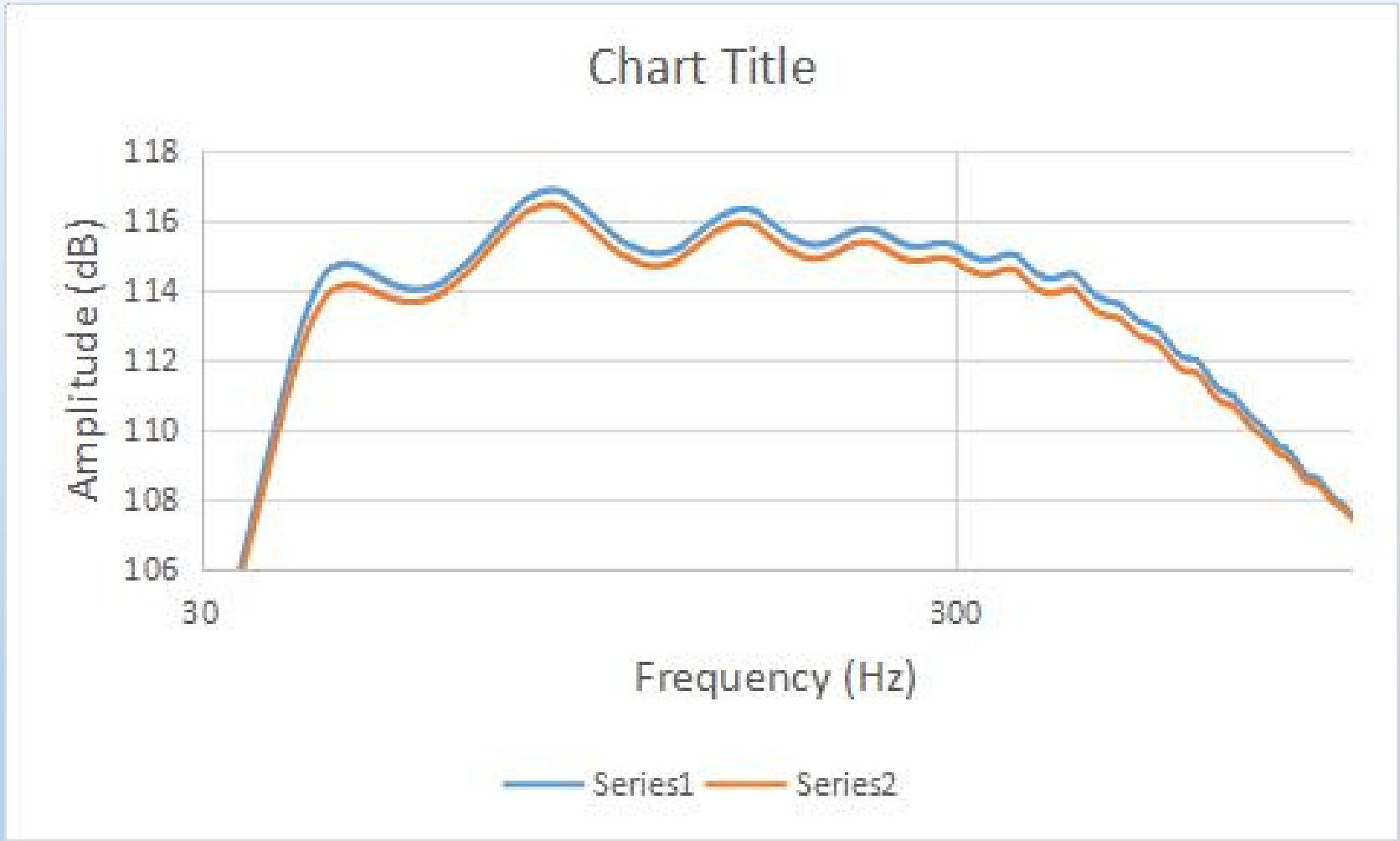
And corresponding LowEnd, HiEnd, and so on are shown.

Driver	LowEnd	HiEnd	Ripple	Eff	Vrc	Record	Octaves
B&C 12BG100 - 39	48.94	293.68	2.378	114.6	80	33	2.585
B&C 12NBX100 - 41Hz	51.07	365.31	2.053	115.7	80	34	2.839
B&C 12NW76 - 40Hz	51.86	514.55	1.896	115.8	80	35	3.311
B&C 12PE32 - 50Hz	51.37	655.32	0.536	116.2	80	36	3.673
B&C 12PS100 - 44Hz	49.66	340.67	1.639	115.2	80	37	2.778
B&C 12TBX100 - 42Hz	54.41	327.24	3.484	110.2	80	38	2.588
B&C PS76 - 42Hz	51.2	437.48	1.25	115.4	80	39	3.095
Beyma 12BR70 - 31Hz	41.68	344	2.213	114.2	20	40	3.045
Caire HW321 - 27Hz	42.13	361.28	1.817	114.5	20	41	3.100
Dayton Audio PA310-8 - 39Hz	46.21	372.77	0.953	115.9	20	42	3.012
Eminence Alpha 12A - 49Hz	35.81	547.21	3.78	112.3	40	43	3.934
Eminence Beta 12A-II - 47Hz	39.93	533.82	2.031	115.2	30	44	3.741
Eminence Beta 12LTA - 45Hz	39.01	541.6	2.413	113	30	45	3.795
Eminence Definimax 4012 - 40Hz	48.94	267.69	1.863	114.4	30	46	2.451
Eminence Delta 12LFC - 52Hz	43.67	389.05	1.203	117.9	30	47	3.155
Eminence Delta Pro 12-450A - 44	40.24	574.06	1.827	115.5	30	48	3.834
Eminence Deltalite II 2512 - 44Hz	40.54	573.57	1.772	115.1	30	49	3.823
Eminence Kappa Pro-12A - 37Hz	46.48	449.11	0.739	116.1	20	50	3.272
Eminence Kappalite 3012LF Neo -	44.79	377.86	1.169	115.6	20	51	3.077
Eminence Lab 12 - 22Hz	41.5	239.66	3.293	113.9	15	52	2.530
Eminence Legend BP122 - 35Hz	37.91	423.96	2.7	113.9	30	53	3.483
FaitalPRO 12PR300 12 - 50Hz	45.25	444.54	1.018	118.1	25	54	3.296
Goldwood GW-1238-PA-12 - 44H:	33.04	633.02	3.464	111	50	55	4.260
Goldwood GW-1258-12 - 42Hz	38.91	516.83	2.353	114.2	30	56	3.731

The graph to right shows the fc cutoff and Ripple for all drivers modeled with this type horn. The arrow shows the two best performing drivers (lowest fc and Ripple).



Here is the frequency response of the two. They are essentially the same.



Summary:

The Keele paper, Low Frequency Horn Design by Using Thiele/Small Parameters, was used to model horns with calculated throat sizes, along with rear chamber volume. The throat size calculation yielded very flat SPL curves for most of the drivers. The rear chamber volume however was only close and could be improved by tweaking the value and re-running Hornresp to check the result.

Some of the drivers required impossibly small throats to give a flat response, and therefore were not compatible for use in horns.

The B&C 12PE32 is a perfect driver for a corner horn where fc is close to 50Hz.

Summary cont.:

A higher compression ratio typically gives a wider useful bandwidth.

The main advantage of a high initial flare rate seems to be a reduction of Ripple, and not much of a change in fc.

Several drivers have been selected for a horn with 1/2 the volume of a typical K-horn. Each half will utilize one 12 inch driver.