
subs

cardioid sub array’s

3 basic array’s

End fired

Gradient of reversed end fired

CSA (or Front Back Front)

EVEN DE BELANGRIJKSTE FORMULES:

T(ime) = 1sec / F(requency) = PERIOD of F

INVERSE SQUARE LAW

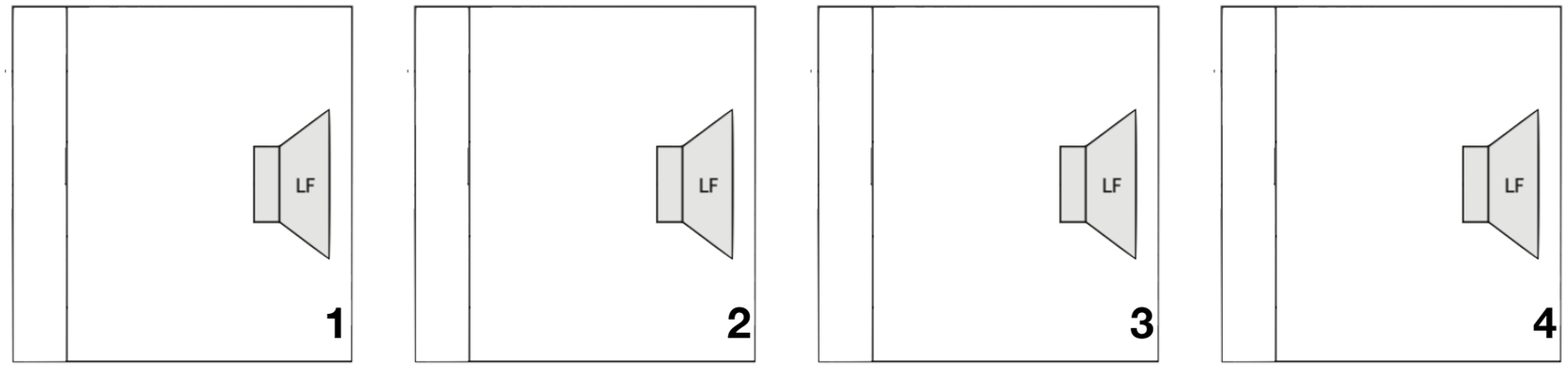
Phase is the conversion of TIME or DISTANCE related to a FREQUENCY expressed in degrees °

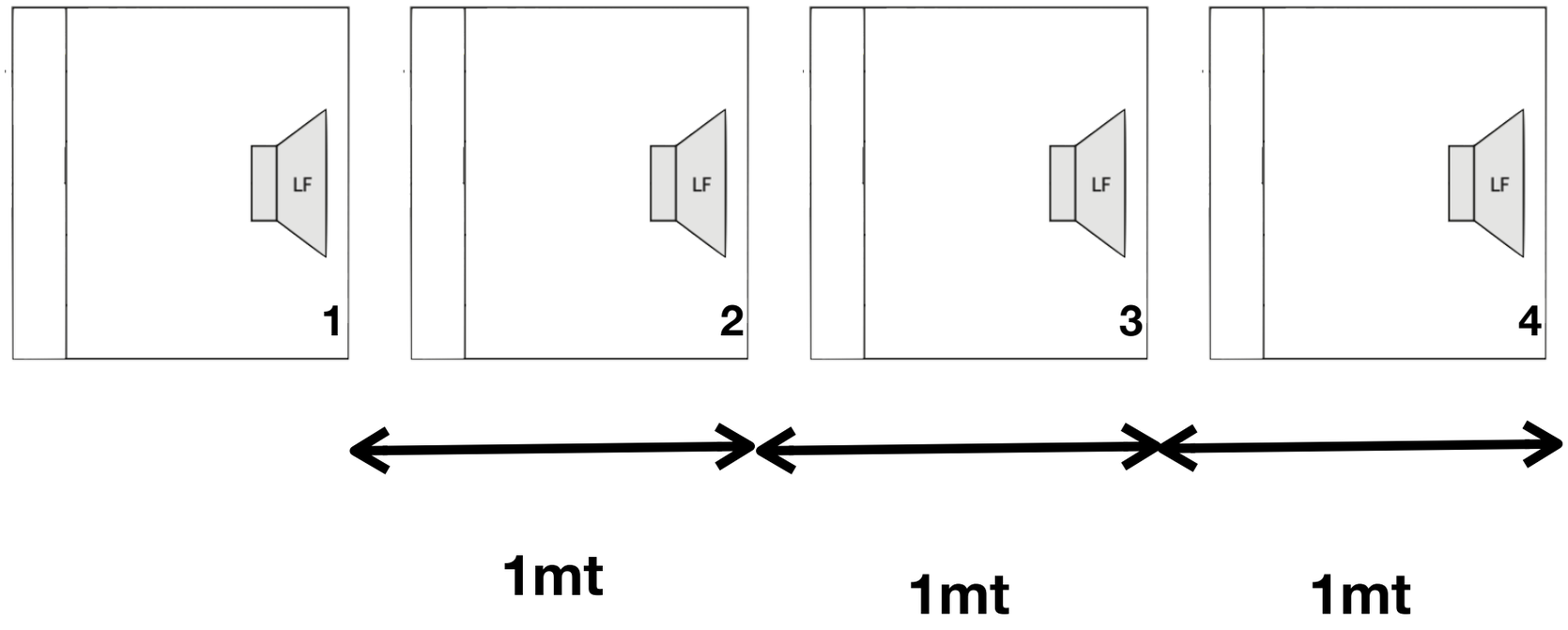
AND PRETTY IMPORTANT

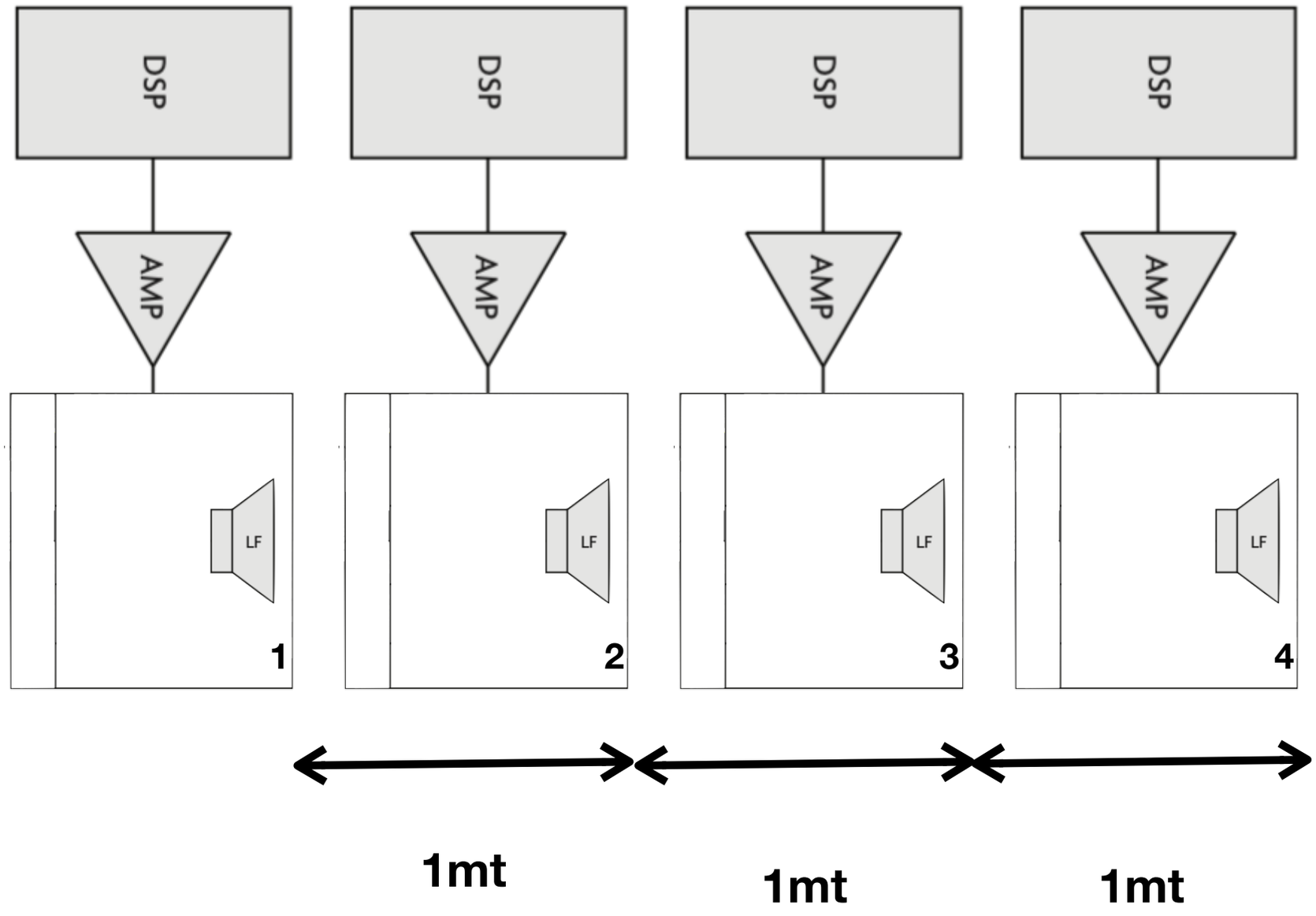
USE COMMON SENSE

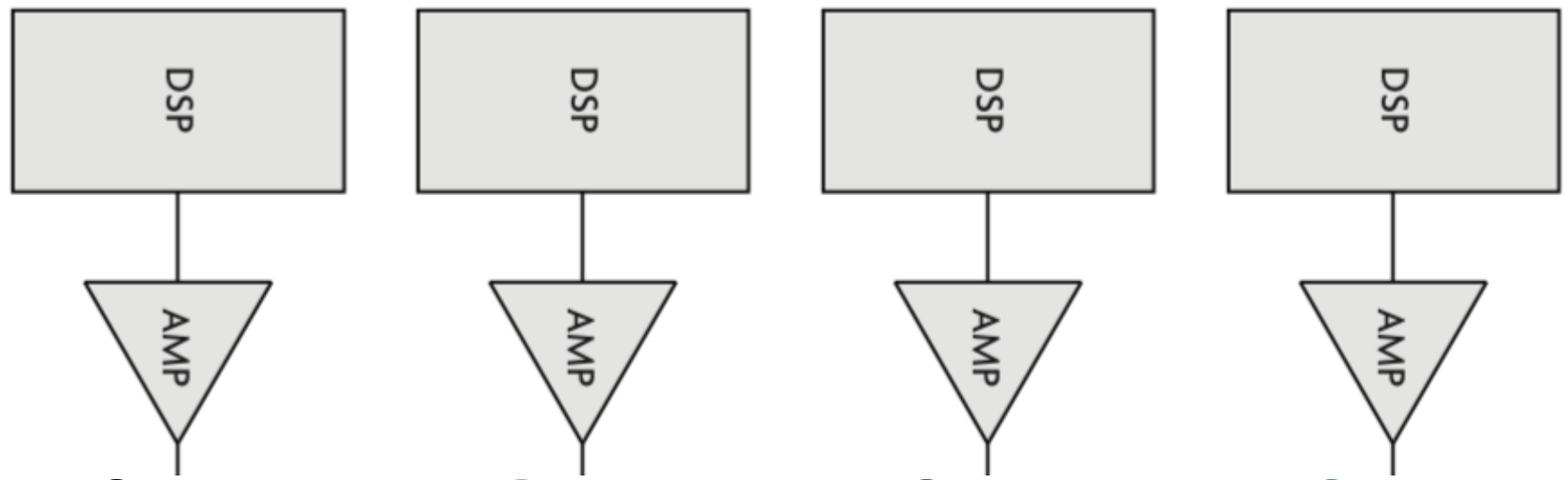
(= OPTIONAL BUT CAN BE HANDY).

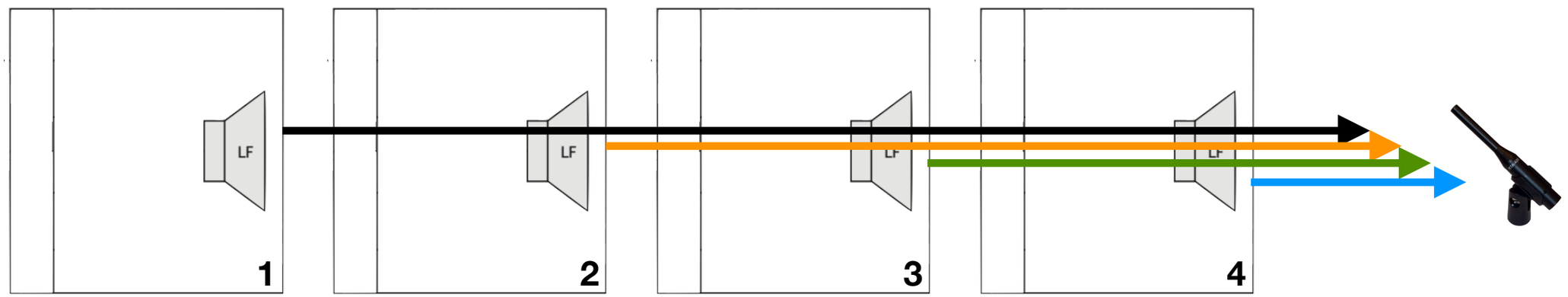
End Fired Sub Array


LF
1
LF
2
LF
3
LF
4


LF
LF
LF
LF
1
2
3
4
1mt
1mt
1mt


DSP
DSP
DSP
DSP
AMP
AMP
AMP
AMP
LF
LF
LF
LF
1
2
3
4
1mt
1mt
1mt

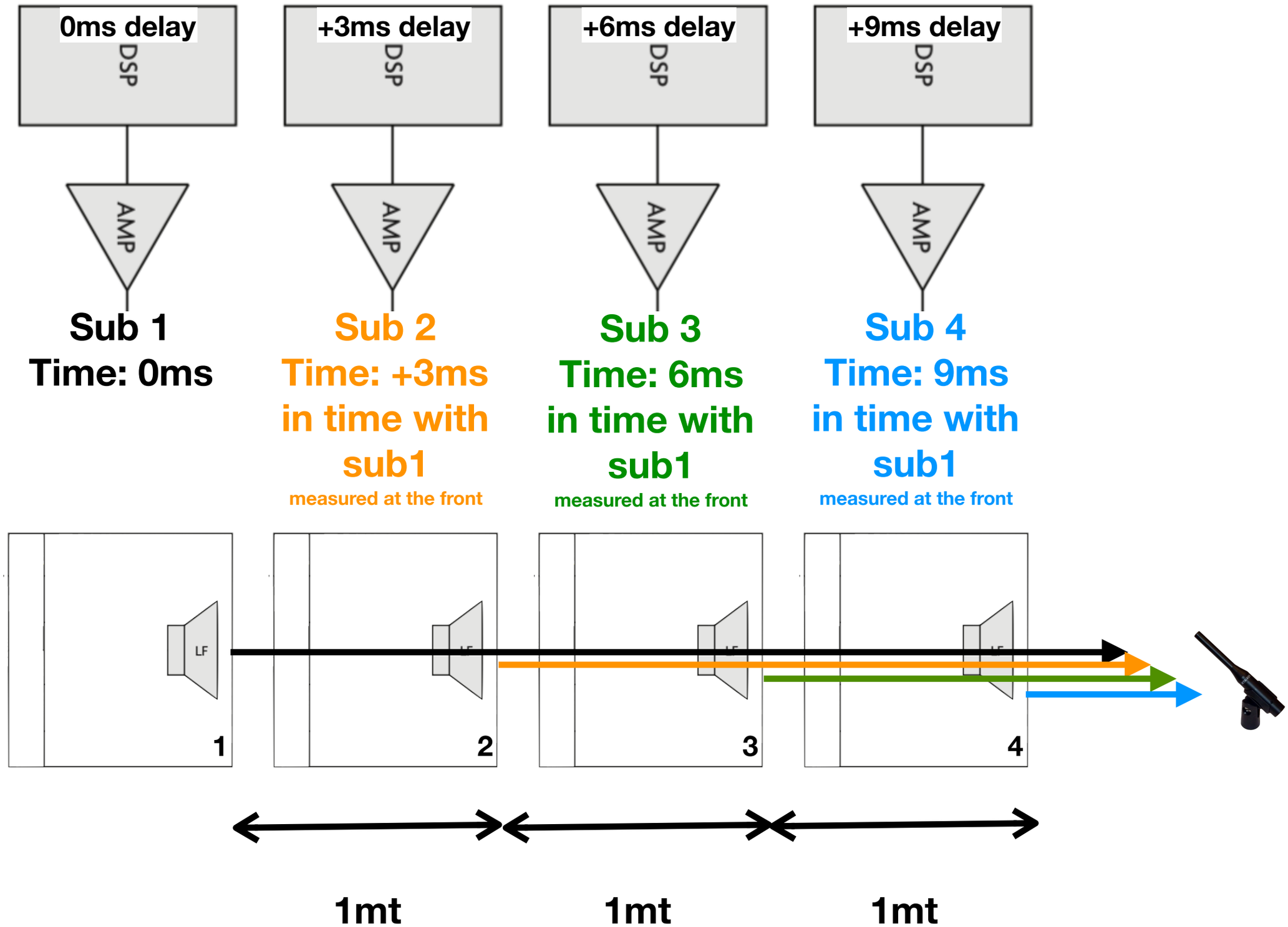




1mt= +/- 3ms delay on sub 2

2mt = +/- 6ms delay on sub 3

3mt =+/-
9ms delay on sub 4

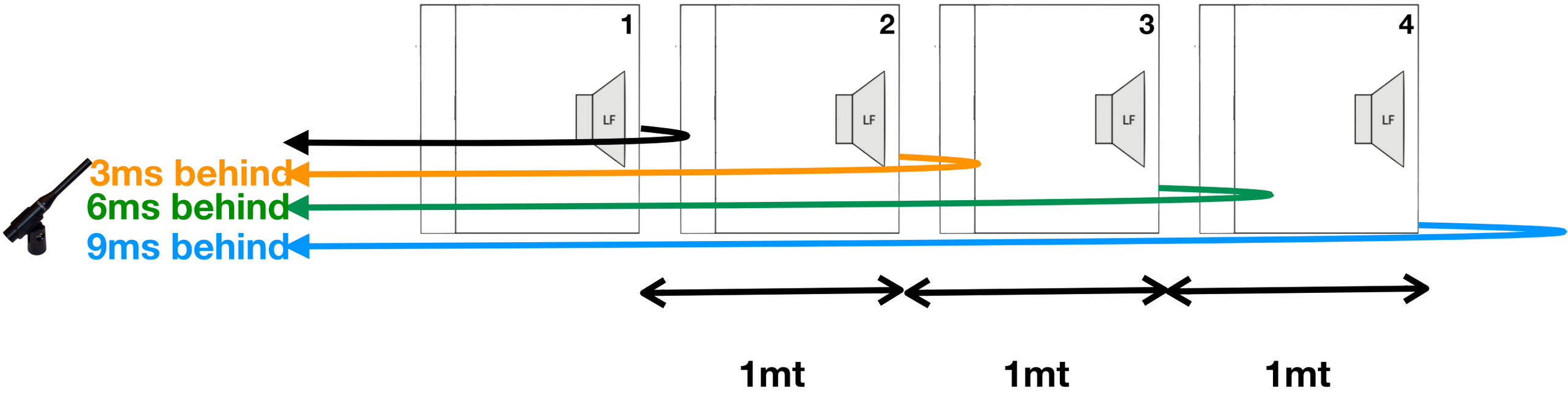

0ms delay
DSP
AMP
Sub 1
Time: 0ms
+3ms delay
DSP
AMP
Sub 2
Time: +3ms
in time with
sub1
measured at the front
+6ms delay
DSP
AMP
Sub 3
Time: 6ms
in time with
sub1
measured at the front
+9ms delay
DSP
AMP
Sub 4
Time: 9ms
in time with
sub1
measured at the front
LF
1
2
3
4
1mt
1mt
1mt

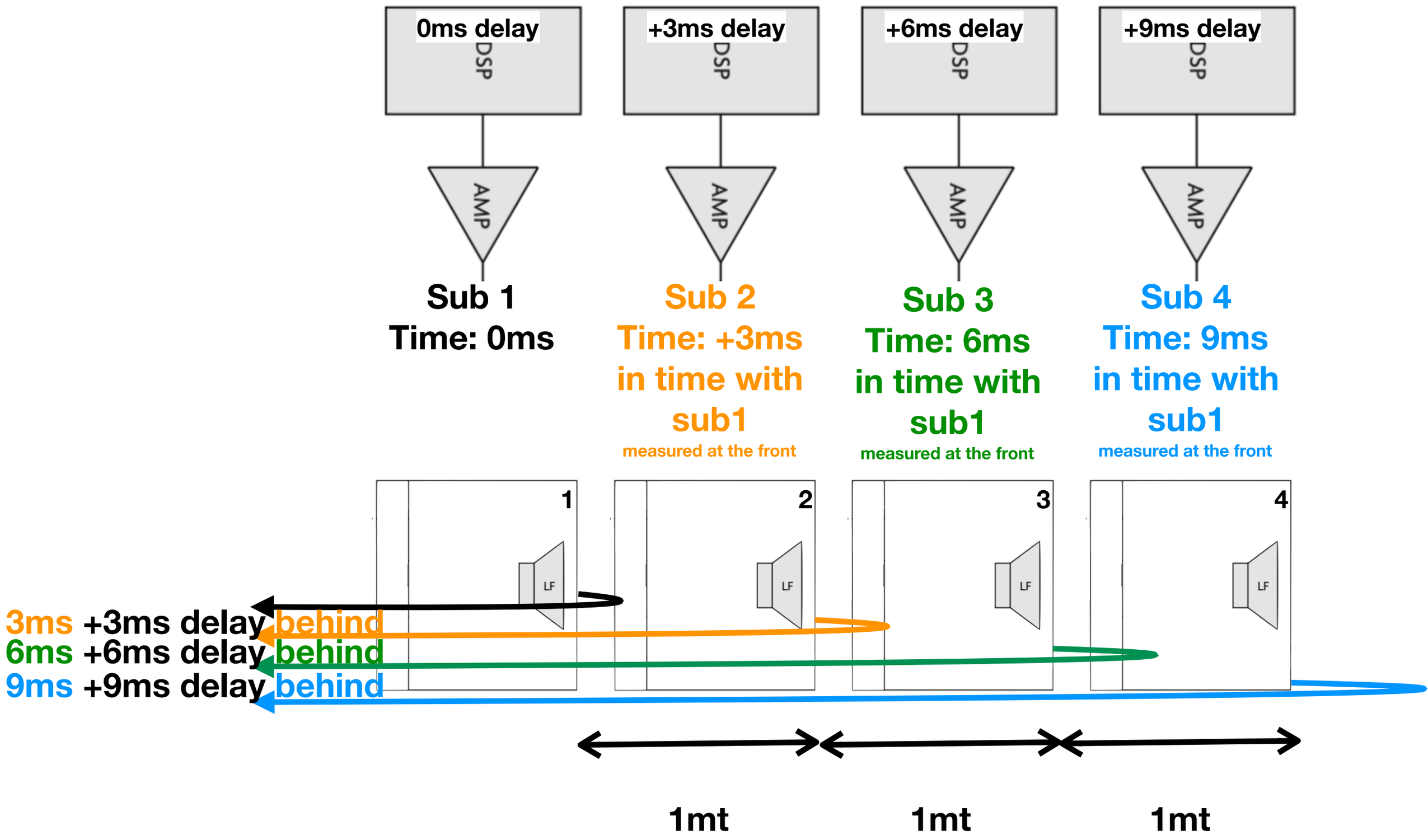
Sub 1
Tijd: 0ms

Sub 2
Time: 0ms
behind sub1
measured at the back

Sub 3
Time: 0ms
behind sub1
measured at the back

Sub 4
Time: 0ms
behind sub1
measured at the back




0ms delay
DSP
AMP
Sub 1
Time: 0ms
+3ms delay
DSP
AMP
Sub 2
Time: +3ms
in time with sub1
measured at the front
+6ms delay
DSP
AMP
Sub 3
Time: 6ms
in time with sub1
measured at the front
+9ms delay
DSP
AMP
Sub 4
Time: 9ms
in time with sub1
measured at the front
1
2
3
4
LF
LF
LF
LF
3ms +3ms delay behind
6ms +6ms delay behind
9ms +9ms delay behind
1mt
1mt
1mt

So what’s happening at the back?

3ms +3ms delay behind

6ms +6ms delay behind

9ms +9ms delay behind

SUB 2 is already late by +/- 3ms. By adding +3ms of delay Sub 2 will be late by +/- 6ms in total. (spacing of 1mt front to front per sub).

F=1sec/T > 1000ms/12ms= 83.3Hz
12ms=360º @ 83.3Hz
6ms=180º @ 83.3Hz and will cause reduction

So what’s happening at the back?

3ms +3ms delay behind

6ms +6ms delay behind

9ms +9ms delay behind

SUB 3 is already late by +/- 6ms. By adding +6ms of delay Sub 3 will be late by +/- 12ms in total. (spacing of 1mt front to front per sub).

F=1sec/T > 1000ms/24ms= 41.6Hz
24ms=360º @ 41.6Hz
12ms=180º @ 41.6Hz and will cause reduction
12ms=360º @ 83.3Hz and will cause addition

So what’s happening at the back?

3ms +3ms delay behind

6ms +6ms delay behind

9ms +9ms delay behind

SUB 4 is already late by +/- 9ms. By adding +9ms of delay Sub 3 will be late by +/- 18ms in total. (spacing of 1mt front to front per sub).

F=1sec/T > 1000ms/36ms= 27.7Hz
36ms=360º @ 27.7Hz
18ms=180º @ 27.7Hz and will cause reduction
18ms=360º @ 55.5Hz and will cause addition

In front of an End fired array you will see +/-12dB addition

(more if you’re lucky)

At the back of an End fired array you will see no real rise in level between Sub 1 solo and the sum of all.

(@ some frequencies you’ll see reduction and @ some frequencies you’ll see addition)

Reversed End Fired of Gradient Sub Array

front view

back view

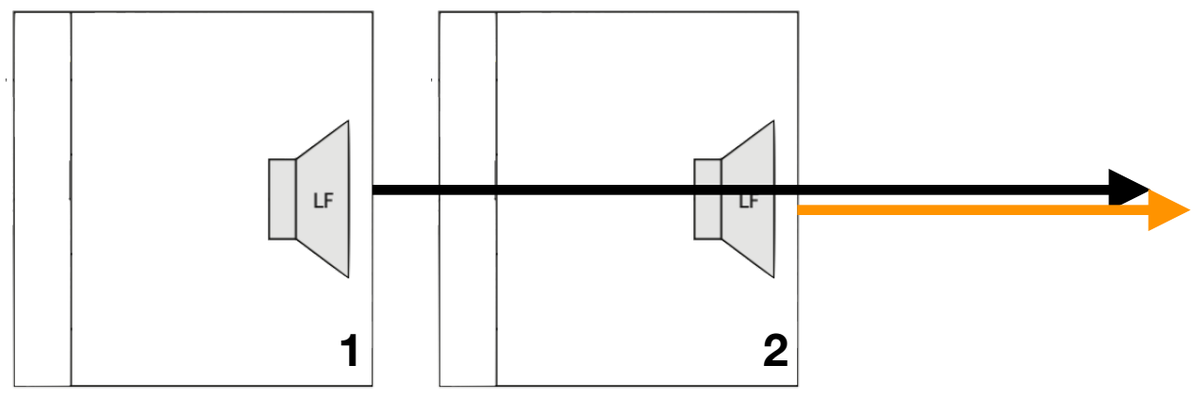
The idea on this array?

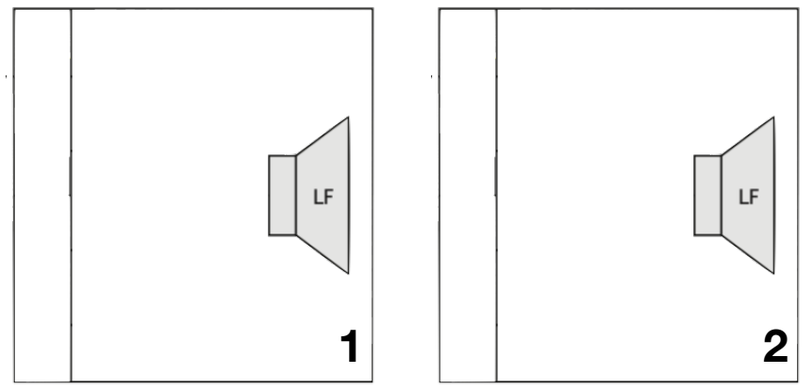
Match the phase response Sub 1 to Sub 2 @ the back of the array

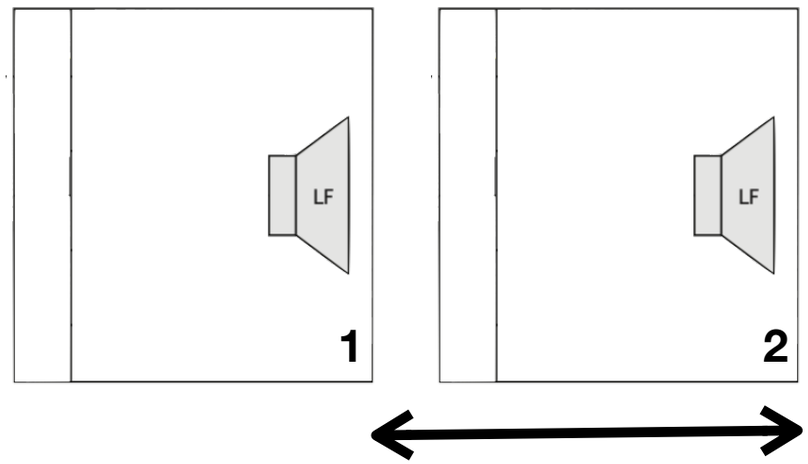
(this will cause at least +6dB addition at the back of the array when Sub 1 & 2 are summed)

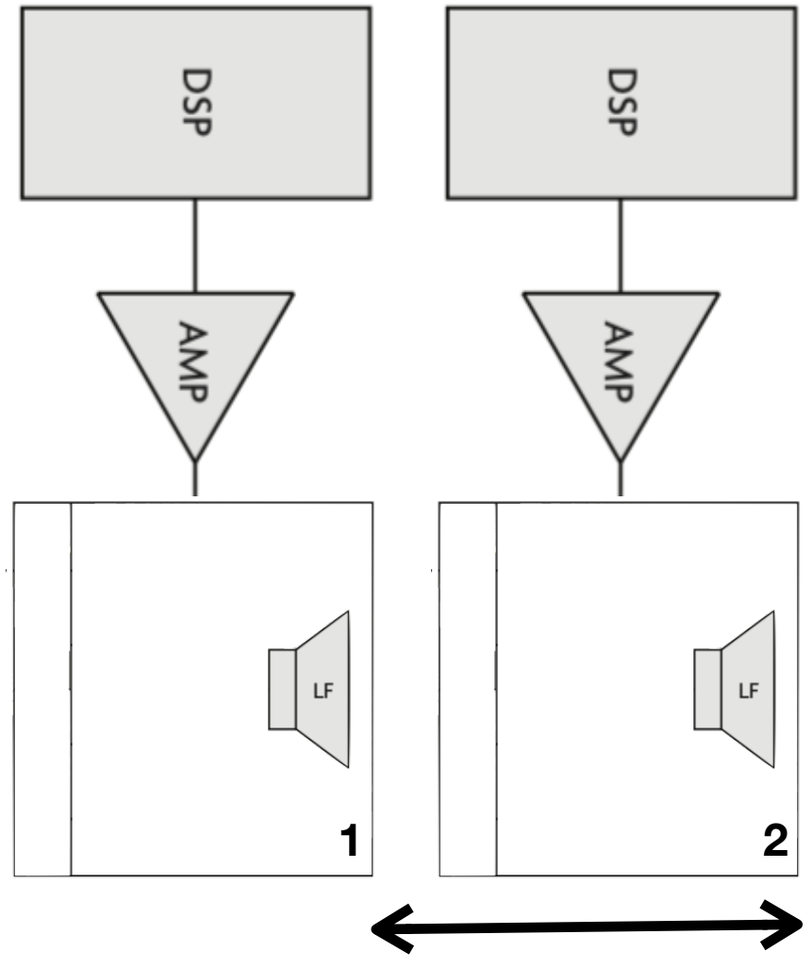
Reverse polarity on Sub 1 after phase alignment to Sub 2 measured @ the back

(this will reduce the cr*p out of it at the back of the array when Sub 1 & 2 are summed (sorry for the bad language))



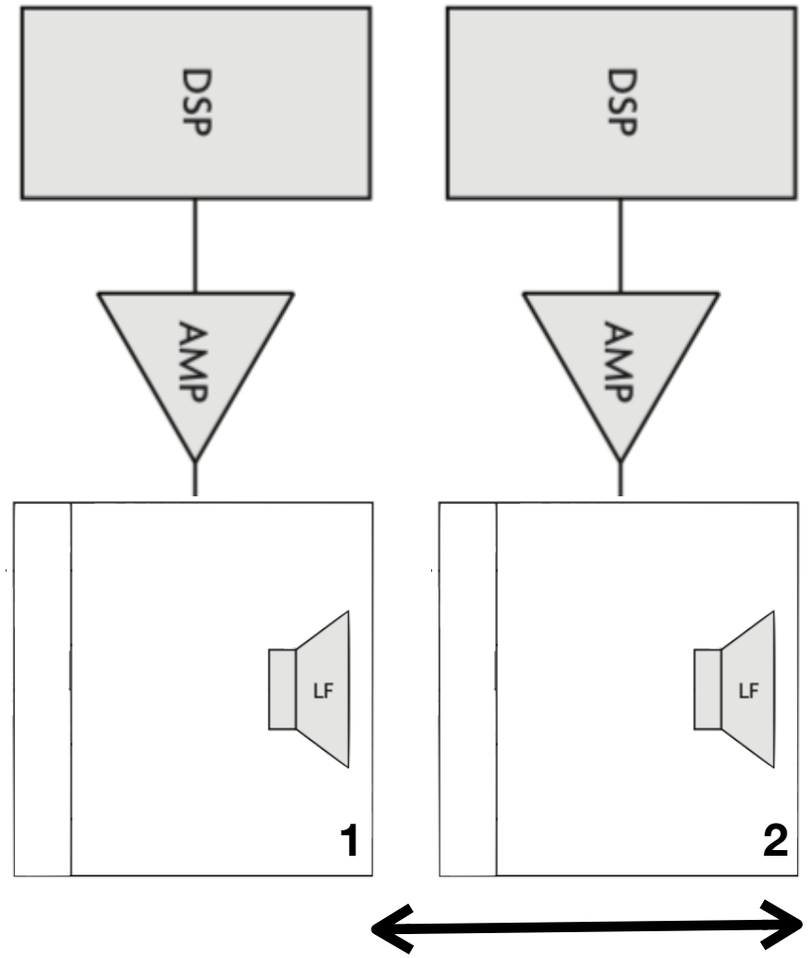

LF
1
LF
2


LF
1
LF
2
1mt


DSP
DSP
AMP
AMP
LF
LF
1
2
1mt

Sub 1
Time: 0ms

Ahead to sub 2
measured @
the back

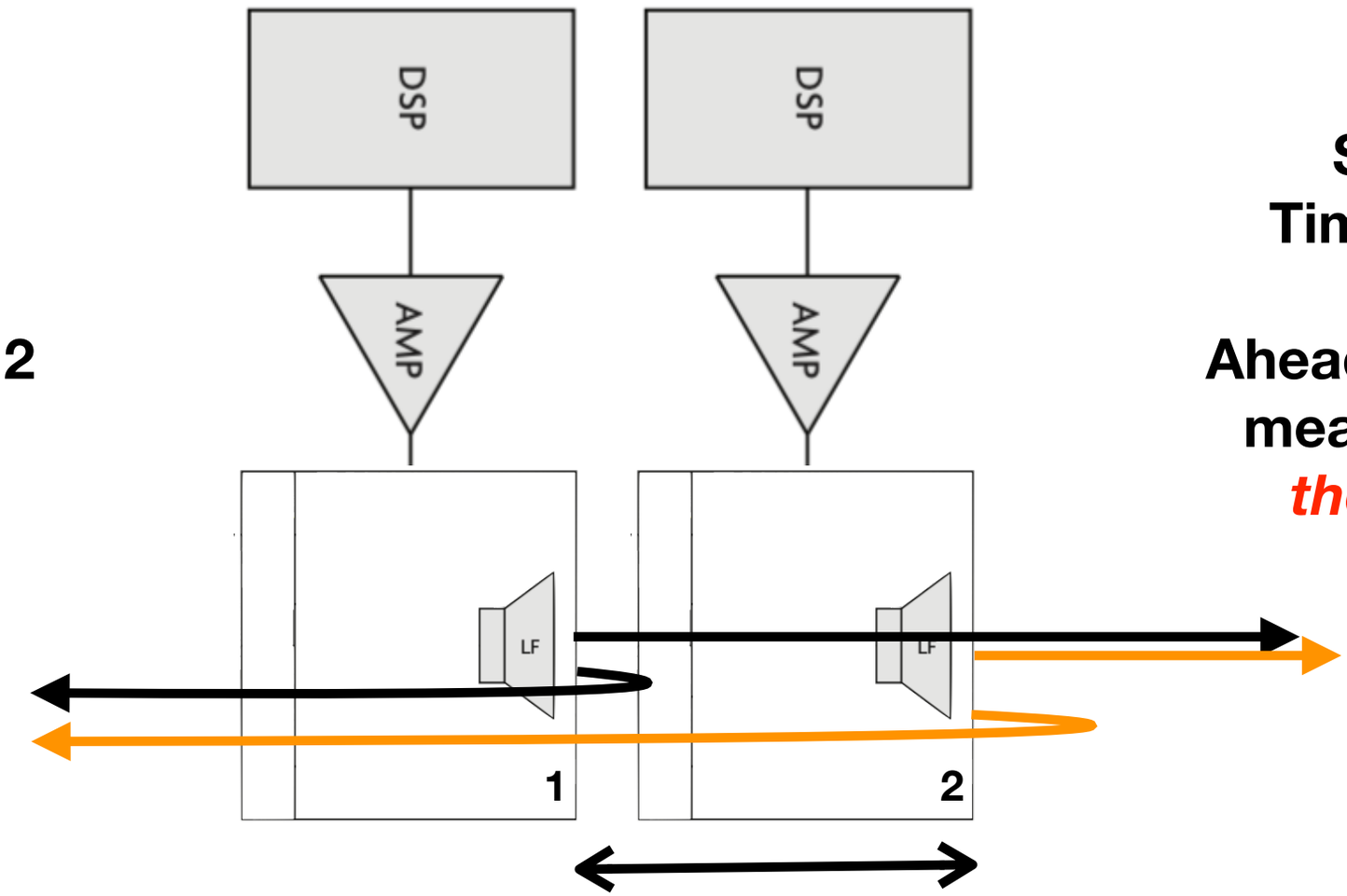


Sub 2
Time: 0ms

Ahead to sub 1
measured @
the front

Sub 1
Time: 0ms

Ahead to sub 2
measured @
the back



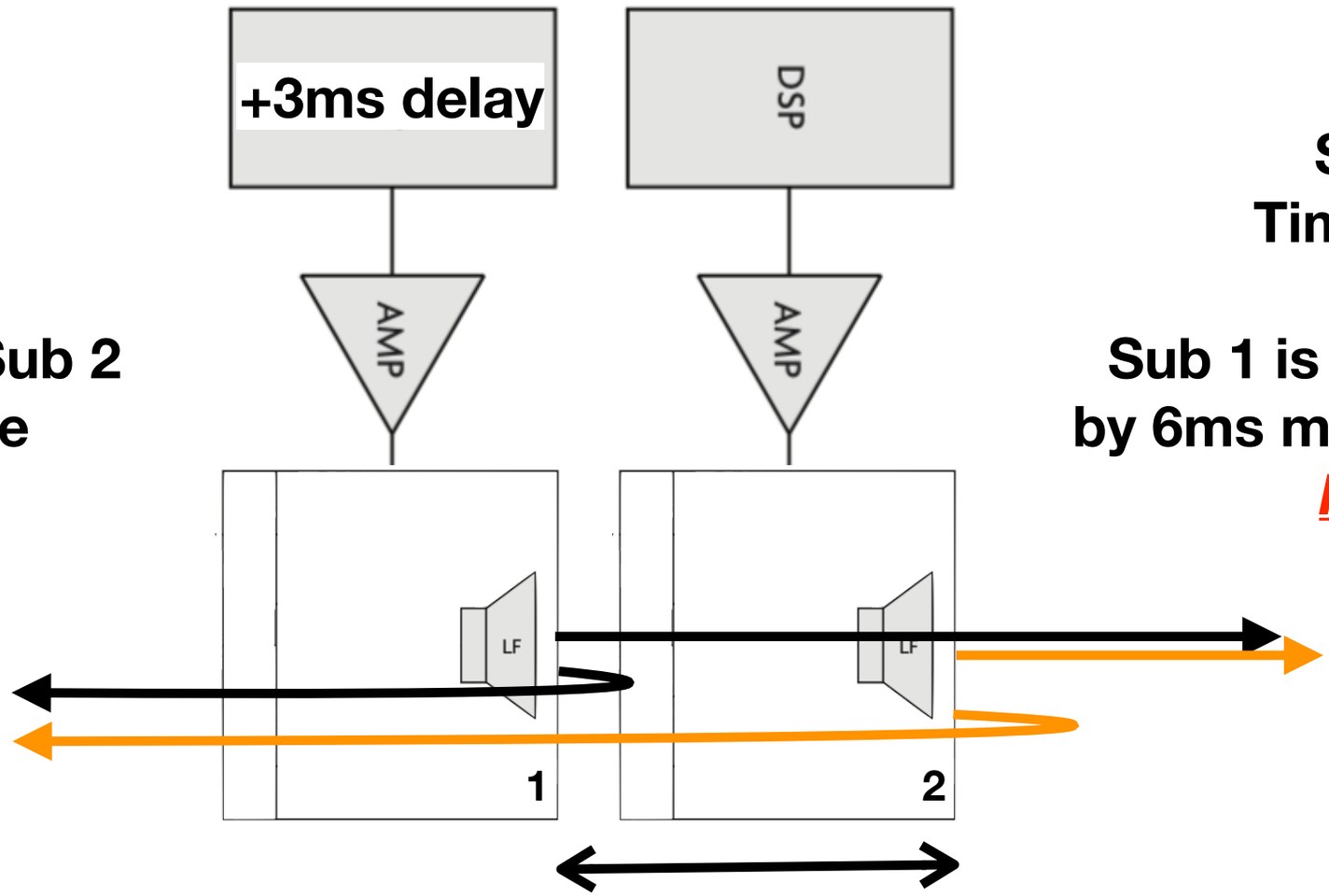
1mt

Sub 2
Time: 0ms

Ahead to sub 1
measured @
the front

Sub 1
Time: +3ms

Phase aligned to Sub 2 measured @ the *Back*



Sub 2
Time: 0ms

Sub 1 is late to Sub 2 by 6ms measured @ the *Front*

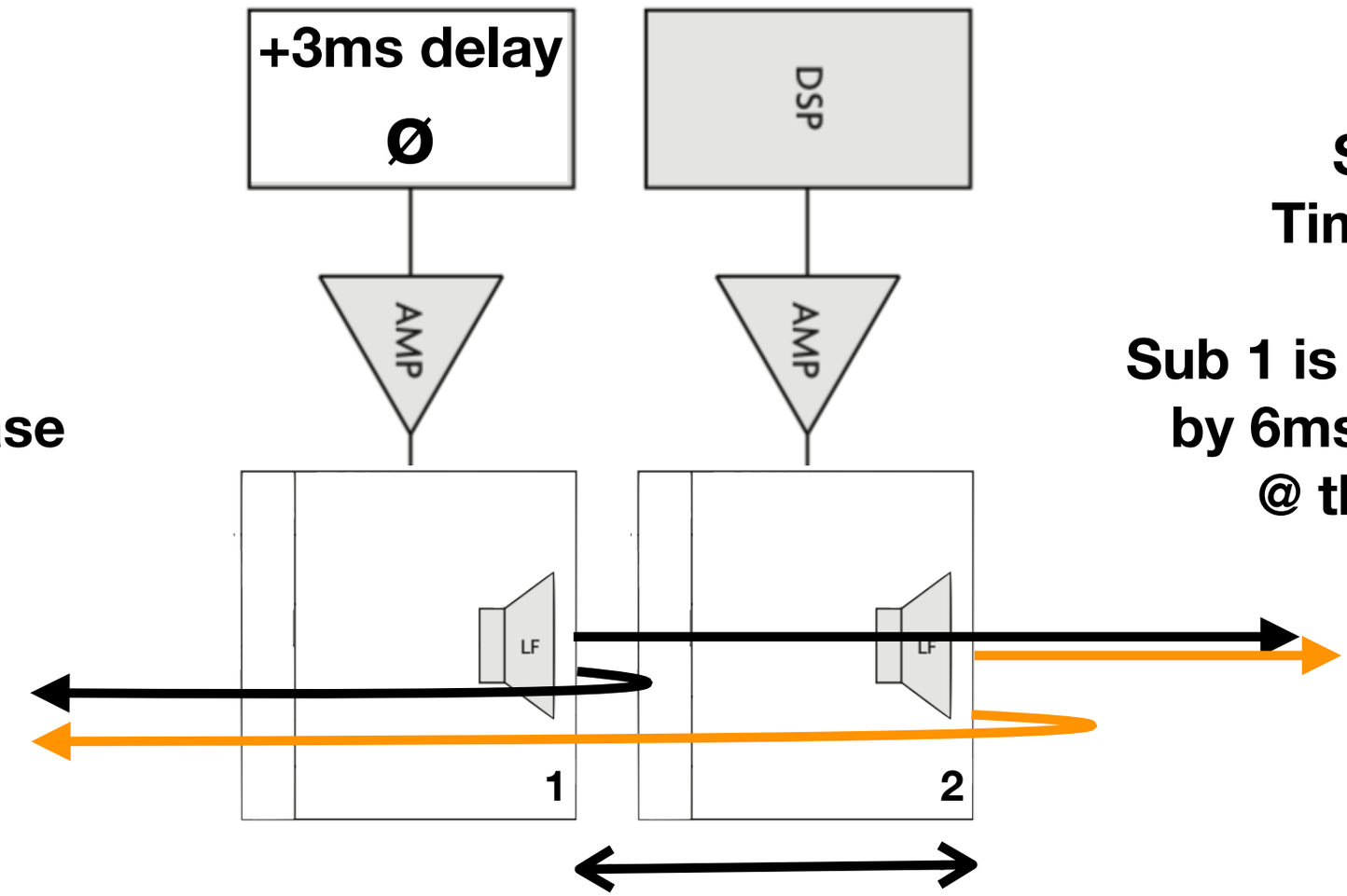
+6db minimal

1mt

F=1/T > 1000ms/6ms = 166.6Hz

@ 166Hz Sub 1 is out of phase to Sub 2 by 360º and will cause addition measured in front of the array
@ 83Hz Sub 1 is out of phase to Sub 2 by 180º and will cause reduction measured in front of the array

Sub 1
Time: +3ms
ø
in time but
180º out of phase
@ the *Back*



Sub 2
Time: 0ms

Sub 1 is late to Sub 2
by 6ms measured
@ the *Front*

1mt

F=1/T > 1000ms/6ms = 166.6Hz

@ 166Hz Sub 1 is out of phase to Sub 2 by 360º and will cause reduction because of the reversed polarity measured *in front* of the array

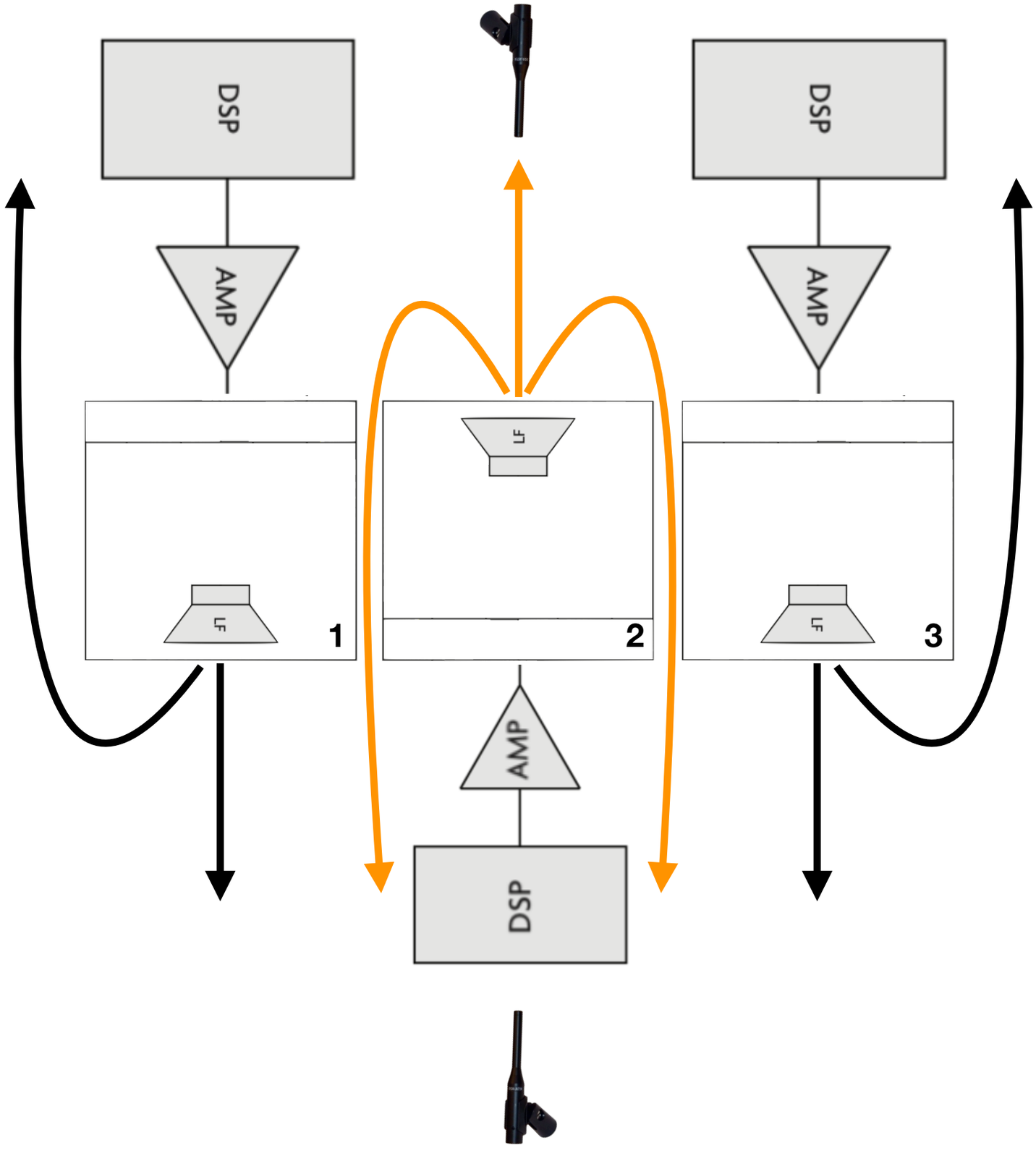
@ 83Hz Sub 1 is out of phase to Sub 2 by 180º and will cause addition because of the reversed polarity measured *in front* of the array

This is *(in my opinion)* the most effective cardioid sub array when it comes to reduction @ the back of the array.

How ever there's a significant "tonal change" at the front of the array.

CSA (cardioid Sub Array) of Front Back Front

This 1 you can figure out yourself


DSP
DSP
AMP
AMP
LF
LF
1
2
3
AMP
DSP

Some nice ideas ;-) ?

Forward Steering Array single (JBL)

Some nice ideas ;-) ?

End Fired Array 3 x Front/Back stack (TBG (= Timo Beckman Geluidstechniek))