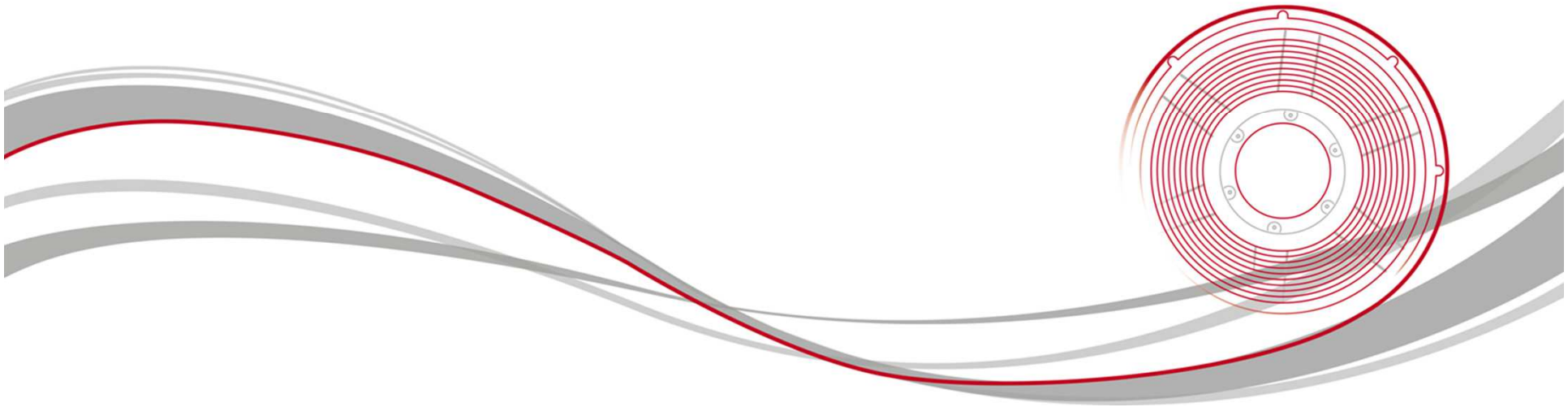
EIGHTEEN SOUND

PROFESSIONAL LOUDSPEAKERS

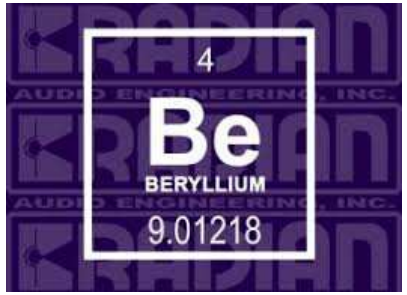
May 2018

BERYLLIUM DRIVER

our experience



FLAGSHIP| BERYLLIUM DRIVER



Beryllium has met with great success in terms of image due to some peculiar characteristics that make it – theoretically – one of the best material for the construction of high frequency loudspeakers (tweeters and compression drivers).

- extreme rigidity (Young's Modulus)
- low specific weight (density)
- non-deformability (tensile strength)
- speed of sound in the material
- intrinsic damping

… and

- all this leads to consider the movement of BE dome as truly pistonic up to the limit of audio band.
- Its high cost and dangerousness have made it an esoteric material relegated to Hi-Fi and High-End systems end PRO audio components

MATERIAL CHARACTERISTICS| BERYLLIUM DRIVER

Properties	Beryllium	Titanium	Aluminum	Magnesium	BE vs. TI
PhysicalProperties					
ρ Density @25°C, g/cm3	1,85	4,51	2,78	1,77	-59%
α CTE @25°C, ppm/°C	11,5	8,60	23,2	26,0	34%
λ Thermal Conductivity @25°C, W/m·K	216	16,4	193	96,0	1217%
C Specific Heat @25°C, J/g·°C	1,93	0,52	0,88	1,00	268%
MechanicalProperties					
UTS Ultimate Tensile Strength, MPa	370	344	186	255	8%
YS Yield Strength, MPa	240	275	75,8	150	-13%
E Young's Modulus, GPa	310	105	73,1	45,0	195%
v Poisson's Ratio	0,032	0,37	0,33	0,35	-91%
c Speed of Sound, m/sec	12.945	4.825	5.128	5.042	168%

In compression drivers (VC > 2") is used a TI foil with thickness of 40 ÷ 60 µm on 3" and 4" VC drivers we use same BE thickness: ~ 50 µm

- the weight of the dome alone is less than half (BE vs. TI)
- the Yield Strength is comparable
- the 1° bending mode (break-up frequency) is related to the speed of sound in the material
- excellent thermal conductivity allows uniform heat distribution

PRODUCTS| BERYLLIUM DRIVER

- 4” ND4015BE

OD = 150 mm

- 3” ND3SBE

OD = 120 mm

- 3” ND1480BE

OD = 131 mm

PERFORMANCE| BERYLLIUM DRIVER

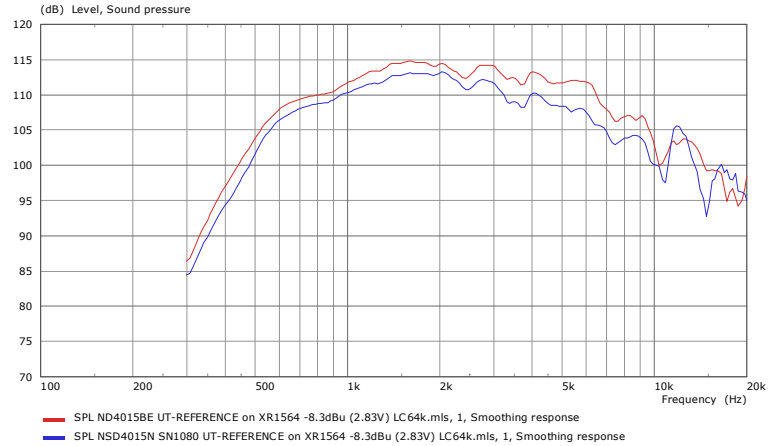
- It is not trivial to relate better theoretical driver performance with real measures
- there are many factors that influence overall behavior and it is not always possible to separate contributions from different parts (geometry, materials, process, glues, ...)

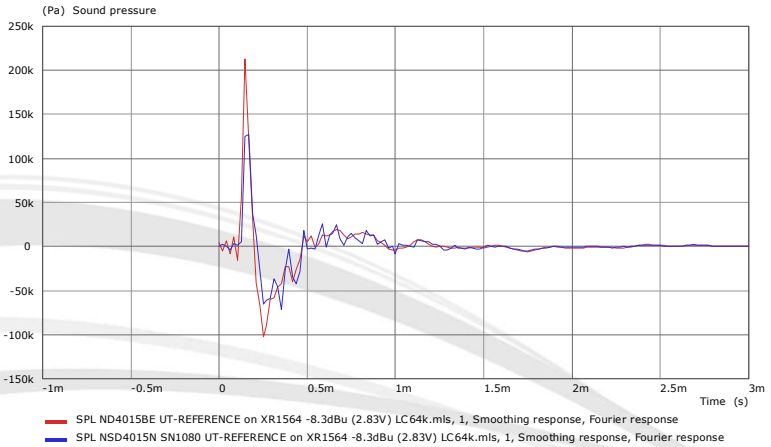
- The differences in traditional measures (frequency domain or time domain) do not highlight sound differences that a listener can clearly perceive.

- Why is beryllium important for 18S? For us the BE performances are the benchmark to compare other dome materials and different solutions (geometry, glue, …)

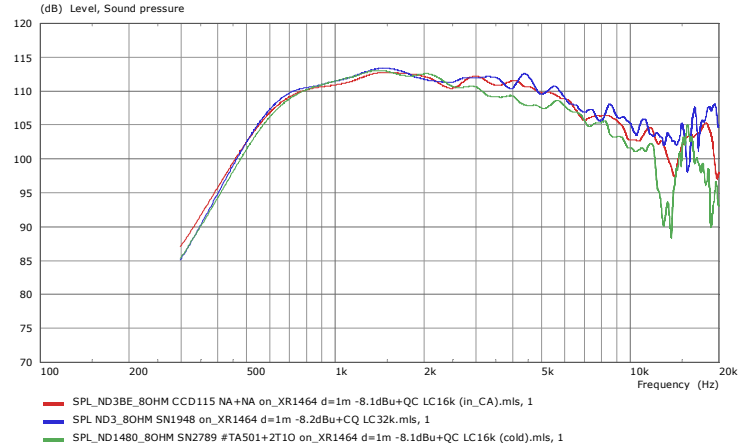
MEASURE AND COMPARISON| BERYLLIUM DRIVER

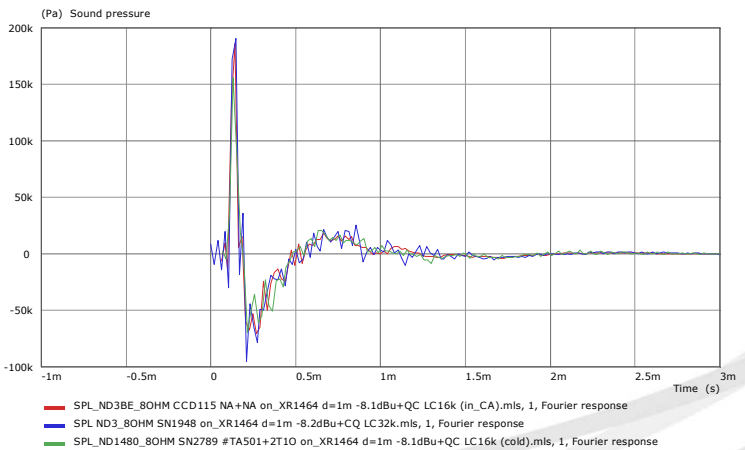
- 4” BE vs TiN





- 3” BE vs. TI

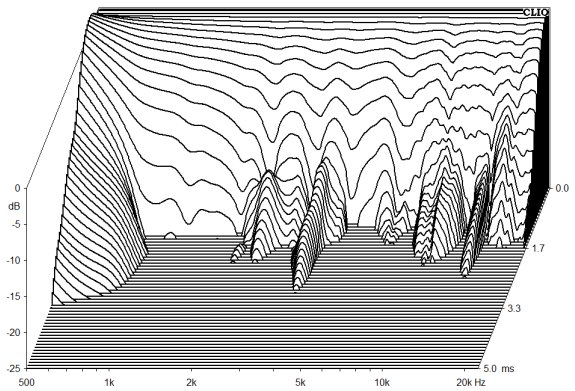




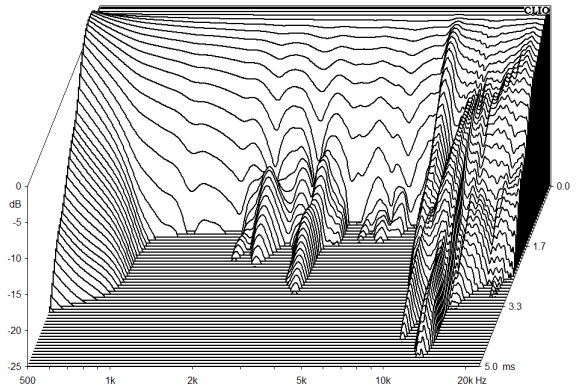
MEASURE AND COMPARISON| BERYLLIUM DRIVER

Time domain: waterfall

- ND4015BE vs. NSD4015N (nitride coated TI)

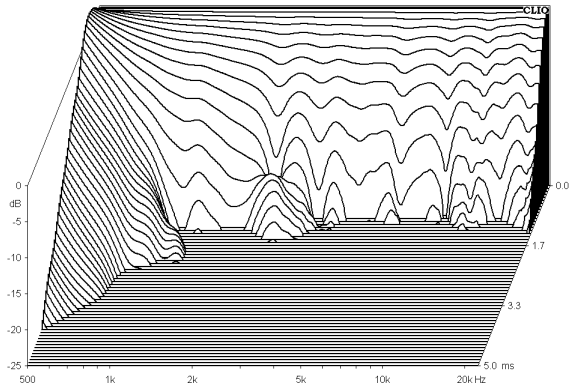


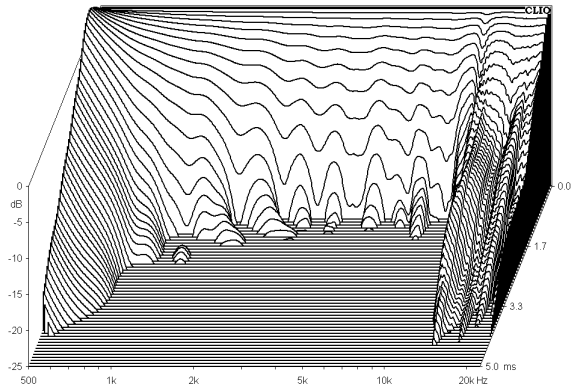
WTF ND4015BE_8OHM on horn XR1564



WTF NSD4015N_8OHM on horn XR1564

- ND3BE vs. ND1480

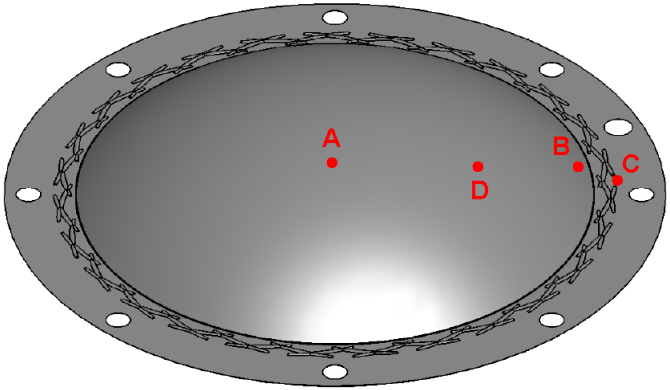




MEASURE AND COMPARISON| BERYLLIUM DRIVER

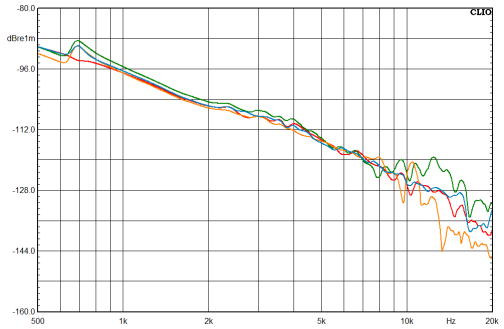
Laser measurement on 4” driver

- BE
- Ti2 (diamond suspension)
- Ti (old design)

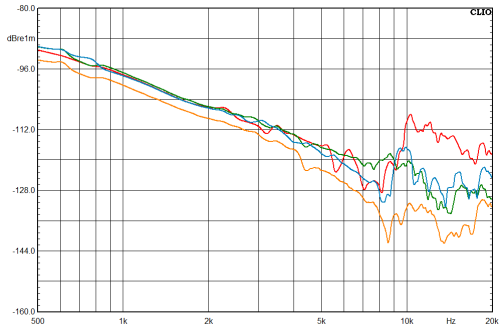


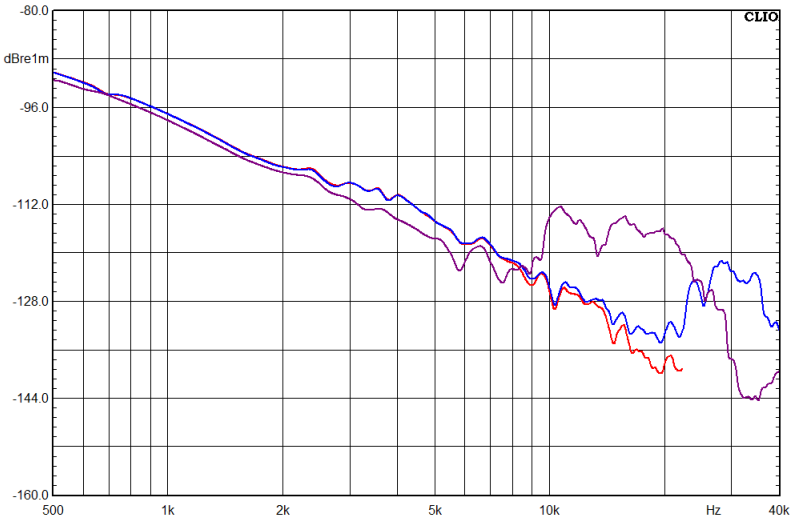
A center - red
B close to VC - green
C suspension - orange
D half of the dome - light blue

BE



Ti2





blu: BE
violet: Ti2
red: BE

thanks