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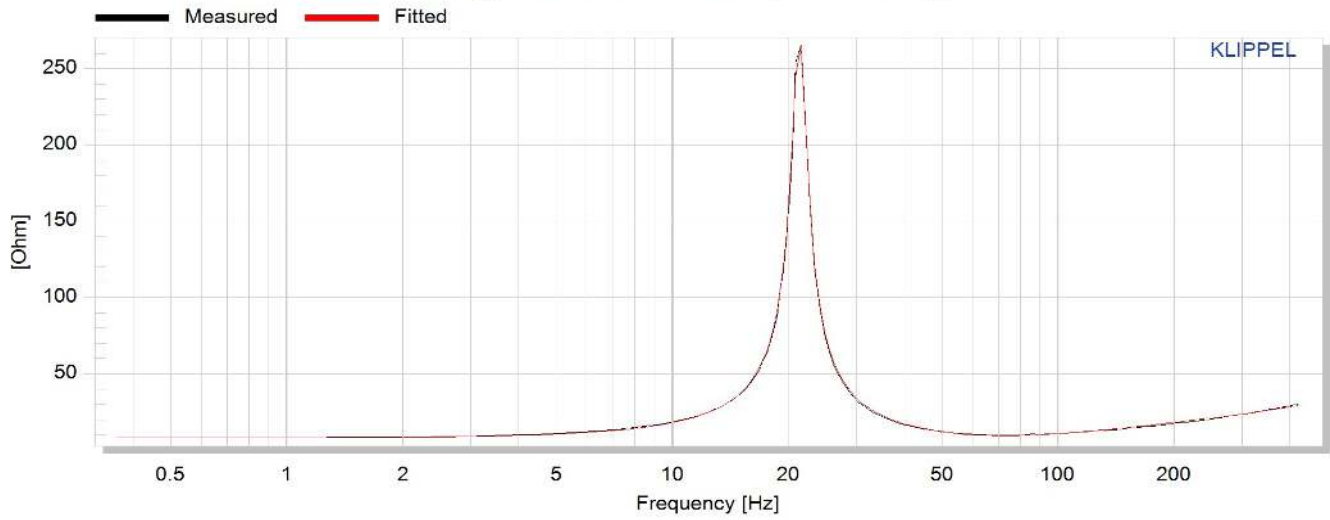
Operation Name	Date	Time
Xmax by 10% THD = 14.7mm	12/03/18	10:18:17
Xmax by IEC-62458 = 3.7mm	12/03/18	10:18:16
LPM auto	12/03/18	09:40:00
LSI auto	12/03/18	09:53:03
DIS auto DC Component	12/03/18	10:02:48
DIS auto Xmax (display state %)	12/03/18	10:18:15
DIS auto Xmax (display state mm)	12/03/18	10:18:15



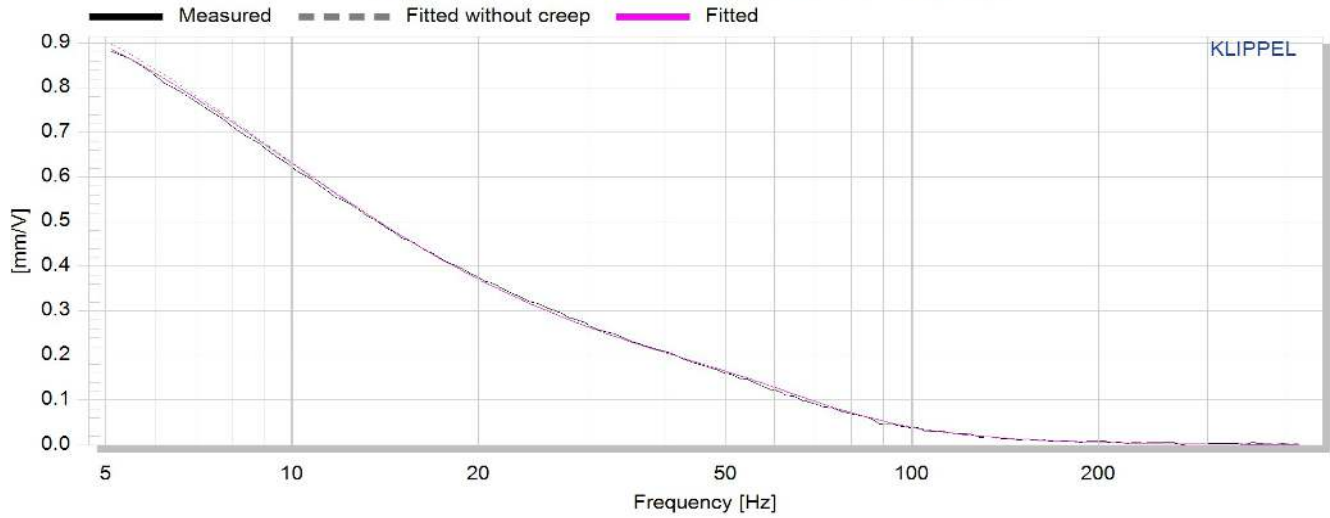
Linear Parameter Measurement (LPM)

Linear Parameters Result Table (abridged)			
Name	Value	Unit	Comment
Electrical Parameters			
Re	7.89	Ohm	electrical voice coil resistance at DC
Le	8.651	mH	frequency independent part of voice coil inductance
fs	21.4	Hz	driver resonance frequency
Mechanical Parameters			
Mms	128.230	g	mechanical mass of diaphragm assembly with air load & voice coil
Mmd (Sd)	115.342	g	mechanical mass of voice coil and diaphragm without air load
Rms	1.598	kg/s	mechanical resistance of total-driver losses
Cms	0.433	mm/N	mechanical compliance of driver suspension
Kms	2.31	N/mm	mechanical stiffness of driver suspension
Bl	20.581	N/A	force factor (Bl product)
Loss factors			
Qms	10.768		mechanical Q-factor of driver in free air considering Rms only
Qes	0.320		electrical Q-factor of driver in free air considering Re only
Qts	0.311		total Q-factor considering Re and Rms only
Other Parameters			
Vas	157.2664	l	equivalent air volume of suspension
n0	0.460	%	reference efficiency (2 pi-radiation using Re)
Lm	88.83	dB	characteristic sound pressure level (SPL at 1m for 1W @ Re)
Lnom	88.89	dB	nominal sensitivity (SPL at 1m for 1W @ Zn)
rmse Z	3.98	%	root-mean-square fitting error of driver impedance Z(f)
rmse Hx	1.24	%	root-mean-square fitting error of transfer function Hx (f)
Sd	506.70	cm ²	diaphragm area

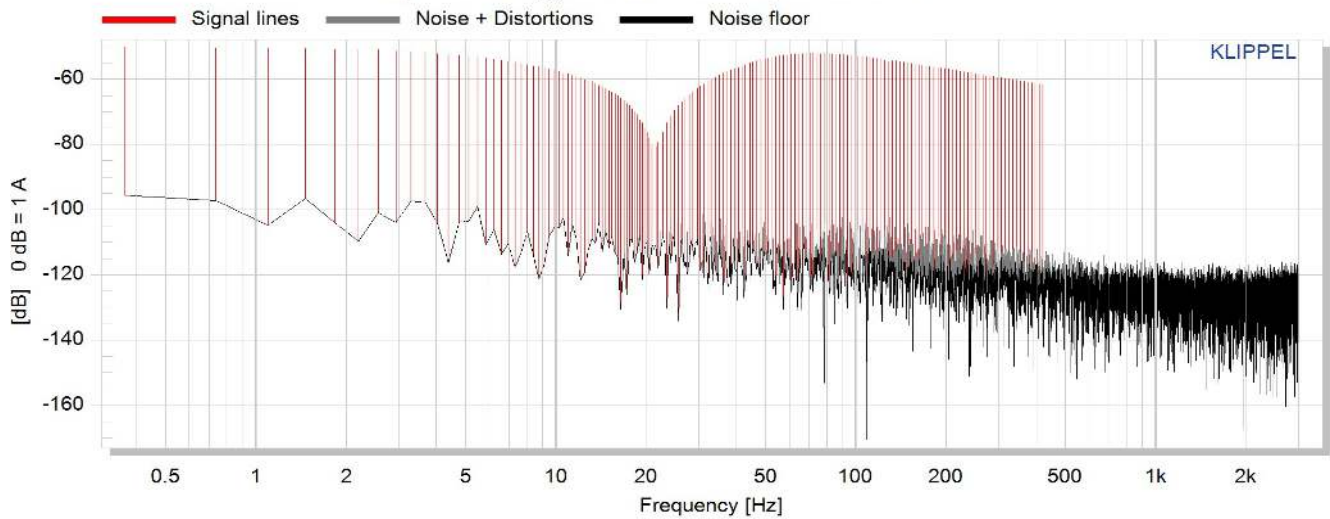
Magnitude of electric impedance $Z(f)$



Magnitude of transfer function $H_x(f) = X(f)/U(f)$



Spectrum $I(f)$ of current at speaker terminals



Xmax Measurements

Value	Method	Measured
Xmax	(by IEC-62458)	3.7mm
X10	(by 10% THD)	14.7mm
XVAR	(by 50% BL or C)	>16.0mm

There are many methods to calculate the linear excursion range of a driver (commonly called Xmax). Some methods are more suitable to some applications, so multiple methods are offered here.

Standard IEC-62458 is an acoustic-based measurement where displacement is determined by both total harmonic distortion and intermodulation distortion. This test is better suited for wide-bandwidth drivers, not bass drivers. This test is based on Klippel's Application Note 4 available at: <http://www.klippel.de/know-how/literature/application-notes.html>

X10 is the measurement listed above as "10% THD". X10 shows an excursion limit is when the driver reaches 10% total harmonic distortion, as measured with a microphone, while playing a sine wave at resonant frequency (fs). This test is more suitable for bass drivers that play low frequencies.

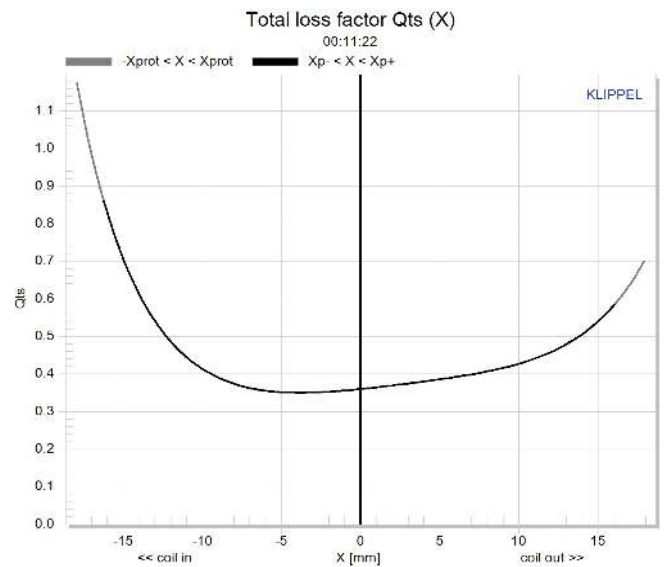
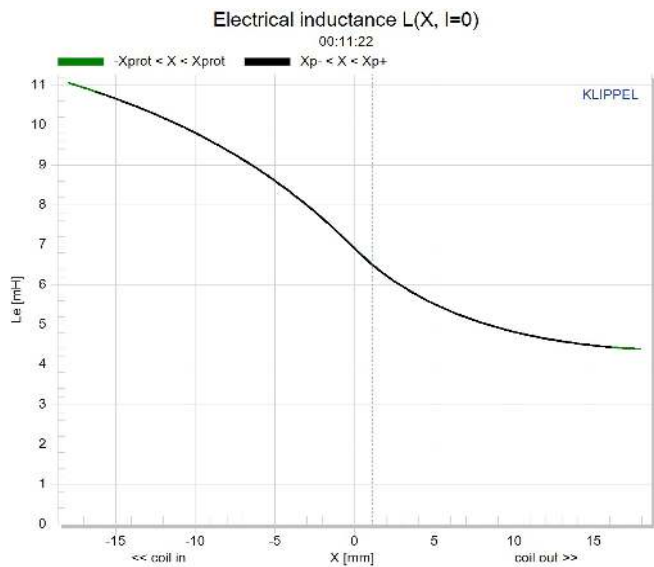
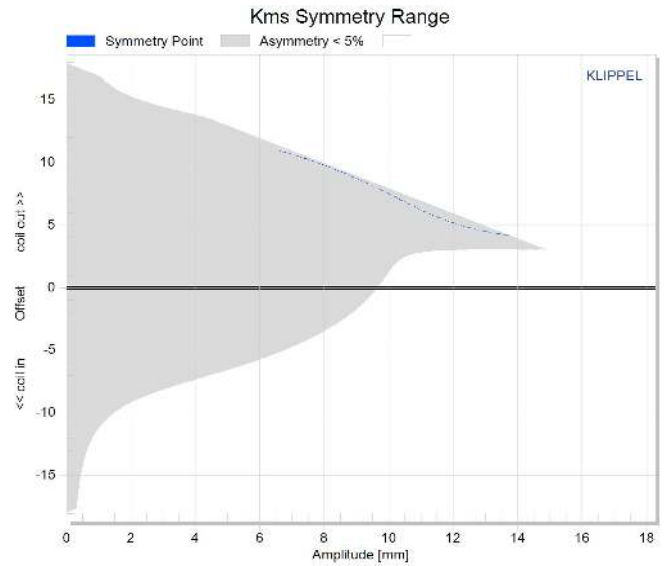
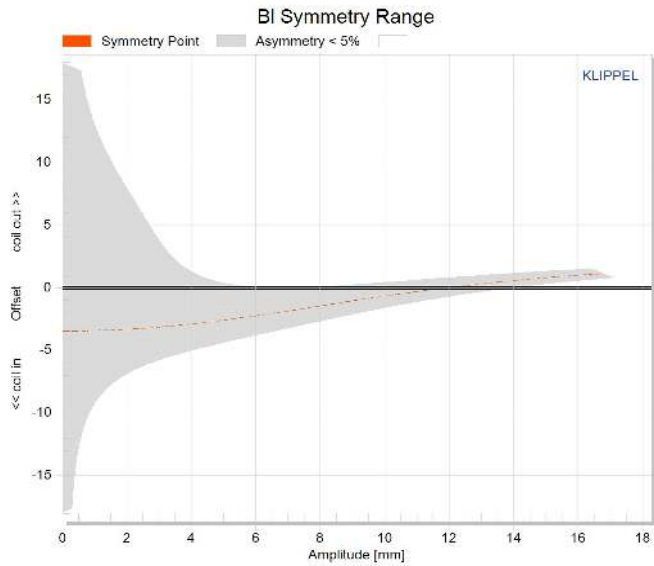
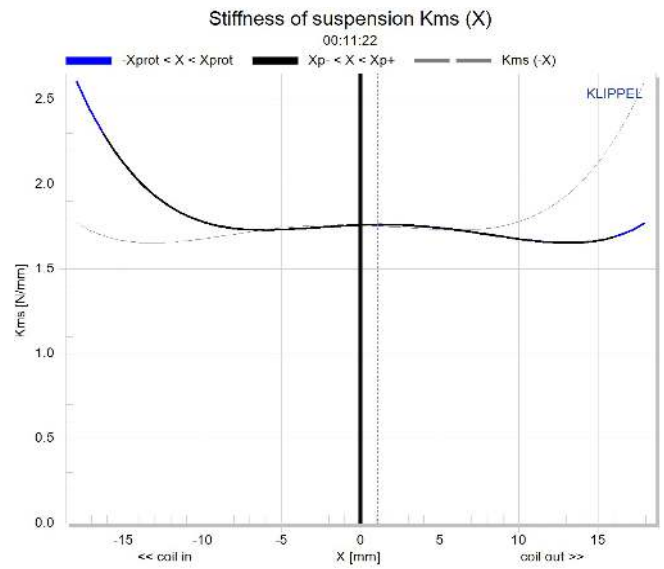
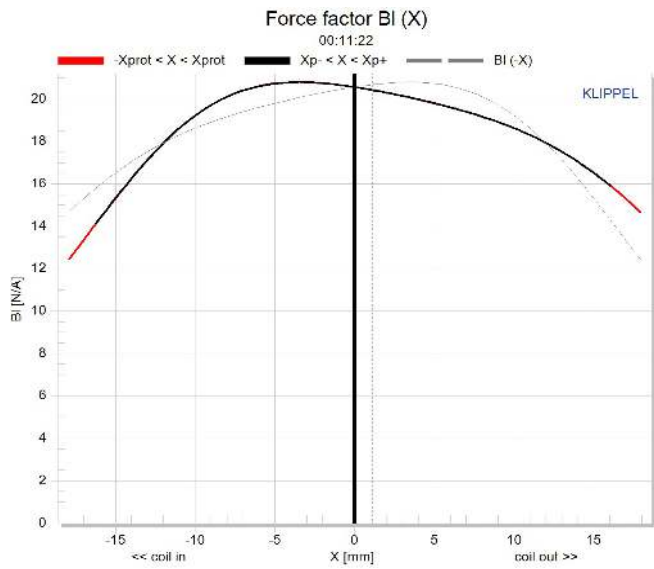
Xvar is the displacement when either motor strength BL or compliance C decay by 50%. The value for Xvar can be found in the *LSI Nonlinear Parameters Result Table* below; it is the lesser of the first two listed values (*BL@min=50%* and also *C@min=50%*). Xvar is sometimes reported as ">x.x" (greater than some displacement) when displacement was limited by a high voice coil temperature.

Large Signal Identification (LSI)

LSI Setup Parameter Table (abridged)			
Name	Value	Unit	Comment
Protection (Property Page)			
Delta Tlim	100	K	increase of voice coil temp (limit)
Blim	30.0	%	minimal force factor ratio (limit)
Clim	30.0	%	minimal compliance ratio (limit)
Plim	65.000	W	electrical input power (limit)
Gsmall	-10.0	dB	small-signal gain

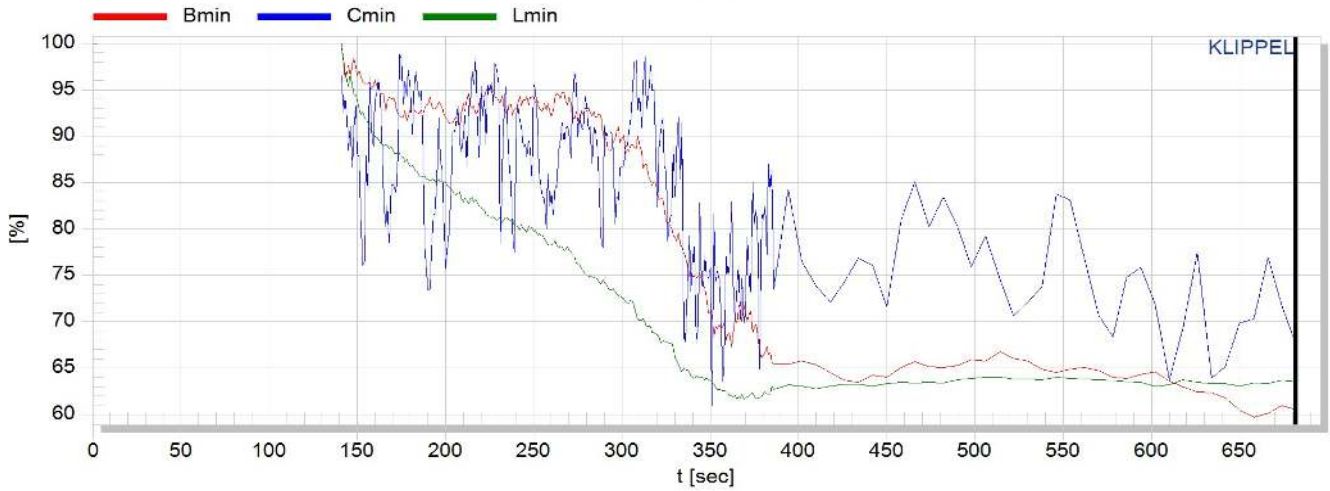
LSI Nonlinear Parameters Result Table (abridged)			
Name	Value	Unit	Comment
Displacement Limits			
X BL @ BL min=50%	>16.0	mm	limit due to force factor variation (used to calculate XVAR)
X C @ C min=50%	>16.0	mm	limit due to compliance variation (used to calculate XVAR)
X L @ Z max=10 %	2.2	mm	limit due to inductance variation
X d @ d2=10%	48.6	mm	limit due to IM distortion (Doppler)
Asymmetry (IEC 62458)			
Ak	38.13	%	Stiffness asymmetry Ak(Xpeak)
Xsym	0.85	mm	Symmetry point of Bl(x) at maximal excursion
Xpse	17.9	mm	-Xpse < X < Xpse, range where power series is fitted

State Result Table (abridged)			
Name	Value	Unit	Comment
t	00:11:22	h:min:s	measurement time
Glarge (Gmax)	20.7 (26.0)	dB	excitation amplitude gain in large signal domain (max)
Xprot	17.9	mm	max voice coil excursion allowed by protection system



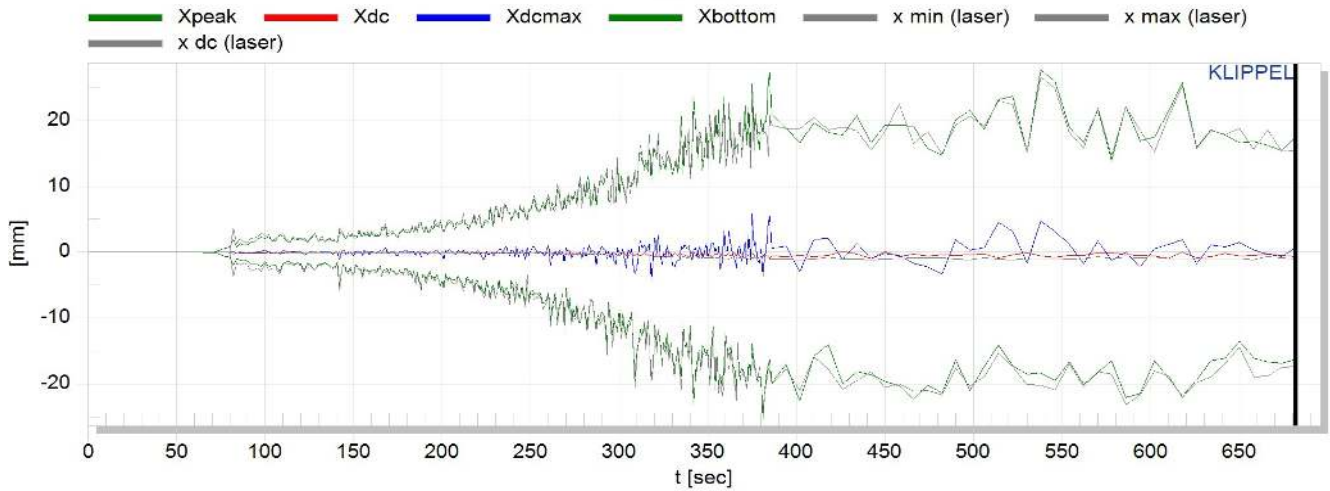
Minimal parameter values

00:11:22



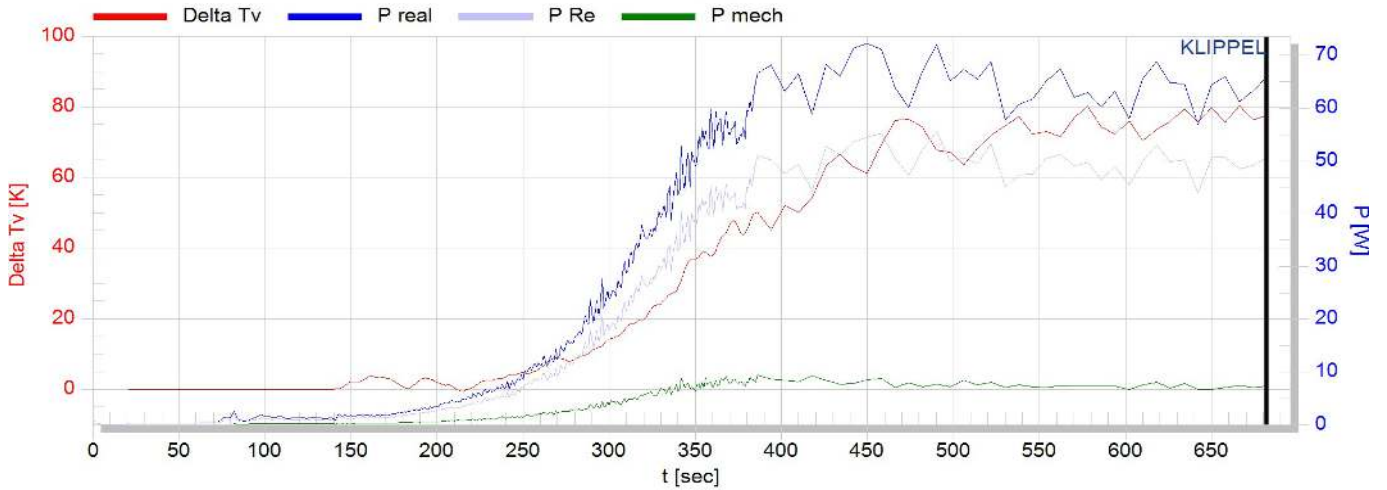
Voice coil displacement

00:11:22



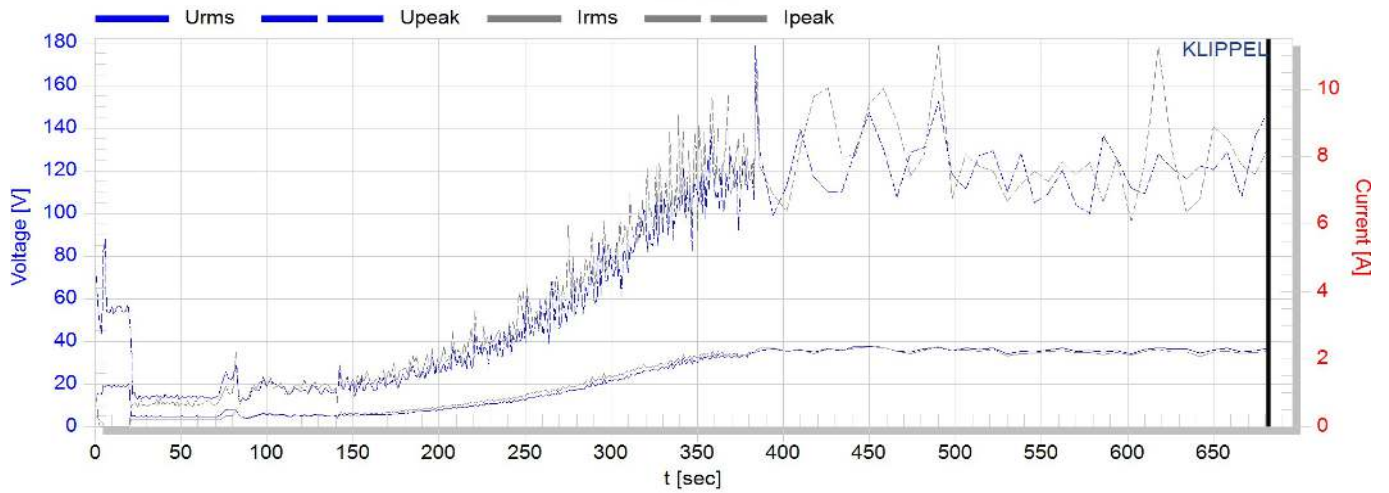
Increase of voice coil temperature $\Delta T_v(t)$ and electrical input power $P(t)$

00:11:22



Voltage Urms, Upeak (t) and current Irms, Ipeak (t)

00:11:22



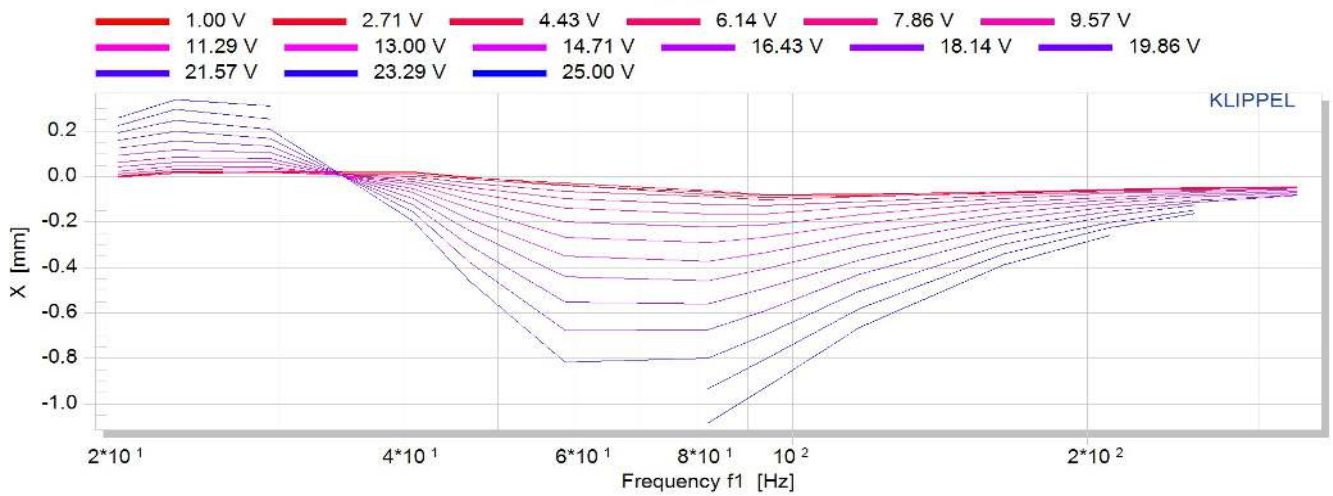
DC Component (DIS)

DIS Table Signal Characteristics (abridged) - (these are the limits of the test)

Name	Value	Unit	Comment
Delta Tv lim	50.000	K	allowed increase of voice coil temperature
dht 1 lim	10.000	percent	allowed total harmonic distortion in signal Y1

DC component

X DC



Xmax measurement graphs

