



HIFUPlex™ LT -01, -02, -03 Depth Focusing

All HIFUPlex LT models are sold through Sonic Concepts, Inc.

The HIFUPlex LT Depth Focusing is a turnkey investigational and upgradable system for high intensity focused ultrasound (HIFU) research. The system is powered using Sonic Concepts' TPO™ drive electronics and HIFU annular array transducer technology.

The HIFUPlex LT Depth Focusing system uses the TPO drive electronics system comprised of four discrete RF signals with independent transmit agility. The TPO uses high-fidelity amplifier technology to produce spectrally pure sinusoidal signals. Each channel supports transmit modes ranging from a single cycle pulse to large bursts.

The HIFUPlex LT Depth Focusing transducer is comprised of four sub-apertures built within the monolithic transducer and includes low-loss cabling and matching circuitry.

The integrated system uses time delay to electronically steer the acoustic focal depth along the axis with micrometer resolution. Acoustic intensity and focal steering calibration are performed within a free field environment using National Physical Laboratory (NPL) traceable hydrophones.

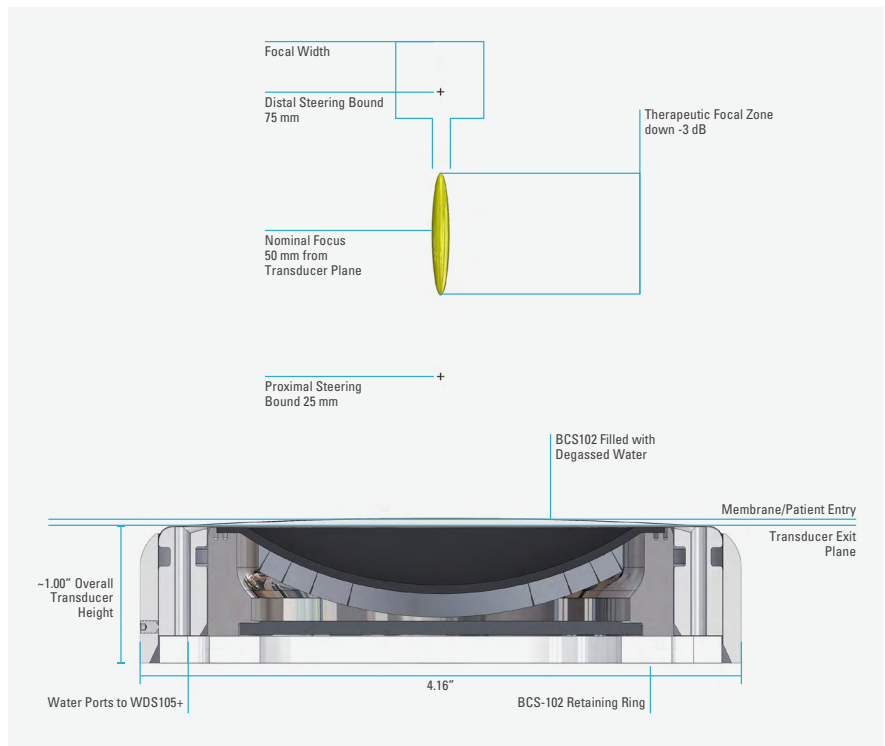
System Features

- HIFU with the option of 50, 210 or 500 Average Watts of Total Acoustic Power (TAP)
- MATLAB Parser Commander Suite
- Portable and user friendly with complex transmit agility
- Dynamic focal depth steering with treatment precision
- Full-system calibration and verification

HIFUPlex LT offers 3 transducer configurations

-01 (500 kHz), -02 (1.1 MHz) and -03 (2.0 MHz).

All three configurations use the same Ø64 mm f/1.0 4-element focused transducer and produce the same amount of total acoustic power with transmit efficiencies up to 90% over a 40% bandwidth.



Transducer Acoustic Performance Specifications

The table to the right features HIFUPlex LT -01, -02 and -03 acoustic performance specifications.

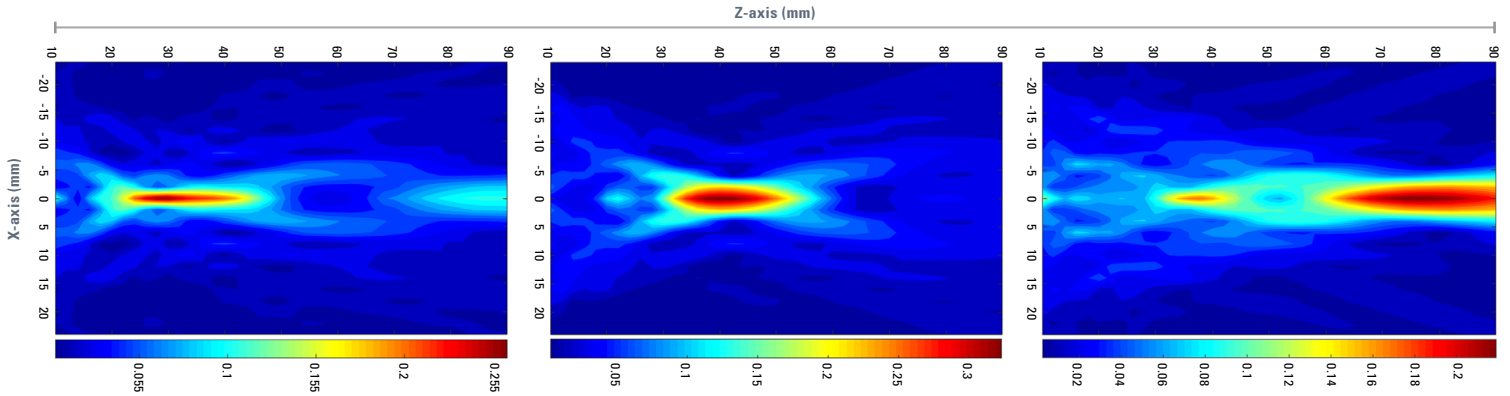
	Fc (MHz)	Radius (mm)	I.D. (mm)	O.D. (mm)	Geometric Focal Distance* (mm)	Lateral Width (mm)	Axial Length (mm)	Pressure Focal Gain	TAP (watts)	Surface Pressure kPa_pk	Focal Pressure ⁺ Mpa_pk	Focal Pressure (w/ 0.7 dB/cm) Mpa_pk
HIFUPlex LT-01	0.5	64.0	31.7	64	52.0	3.1	21.9	13.8	50	238	3.3	2.7
									210	488	6.7	5.5
									500	753	10.4	8.4
HIFUPlex LT-02	1.1	64.0	31.7	64	52.0	1.4	10.5	30.3	50	238	7.2	4.6
									210	488	14.8	9.3
									500	753	22.8	14.4
HIFUPlex LT-03	2.0	64.0	31.7	64	52.0	0.8	5.9	55.1	50	238	13.1	5.7
									210	488	26.9	11.6
									500	753	41.5	18.0

*From the exit plane of the transducer using the BSC-102 coupling system

+Assuming a linear field

Dynamic Focal Depth Steering

The acoustic pressure field maps below illustrate software-controlled spatial modulation of the HIFUplex LT-01 along the transverse plane. The HIFUplex focus is shown at 30 mm (left), 40 mm (mid), and 75 mm (right) depths.



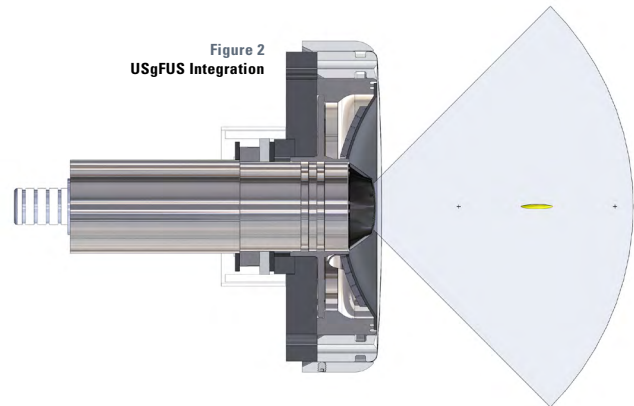
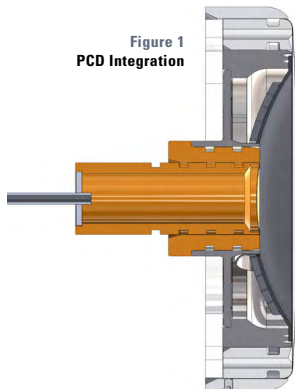
Standard Configuration & Upgrades

The standard HIFUplex LT Depth Focusing system includes one of the three configurations and is calibrated with the TPO-203, a 50 Watts TAP 4-channel drive system. Peripherals include a MATLAB based Commander Suite, BCS-102 water coupling system, visual thermochromatic target and acoustic calibration along the steering axis.

If multiple transducer configurations are ordered they can all be calibrated to the same TPO.

The following upgrades are available and can be added to the standard configuration:

- 210 or 500 Average Watts TAP
- Central opening for PCD and potential USgFUS integration
 - A replaceable passive cavitation detector (PCD) is built integral to the transducer’s central opening for real-time cavitation monitoring (Y-107 is illustrated in Figure 1 below)
 - Potential USgFUS central opening for eventual integration with an imaging probe and Vantage system through Verasonics Inc. and conversion to the Verasonics HIFUplex -01, -02 and -03 (illustrated in Figure 2 below). *HIFUplex Solutions* at verasonics.com/hifuplex
- MRI compatible (not upgradable to Verasonics HIFUplex -01, -02 and -03)
- 3rd harmonic operation with acoustic focus and focal steering calibration (not upgradable to Verasonics HIFUplex -01, -02 and -03)
- Water conditioning unit, including a closed-loop degassing circuit with temperature controlled heating and chilling capability
- Small animal treatment bed with software-controlled transducer positioner including two high-precision linear axes



The table to the right presents the steering range and derated focal pressure when steering down -3 dB for each transducer and TAP configuration.

	Axial Focal Steering down -3 dB		TAP (watts)	Derated Pressure down -3 dB	
	Near Field Distance* (mm)	Far Field Distance* (mm)		Focal Pressure + Mpa_pk	Focal Pressure (w/ 0.7 dB/cm) Mpa_pk
HIFUplex LT-01	25	75	50	2.3	1.9
			210	4.8	3.9
			500	7.3	5.9
HIFUplex LT-02	40	60	50	4.6	3.1
			210	9.5	6.3
			500	14.7	9.6
HIFUplex LT-03	45	55	50	9.3	4.0
			210	19.0	8.2
			500	29.3	12.7

*From the exit plane of the transducer using the BSC-102 coupling system

+Assuming a linear field