

# Benthowaye Instrument Inc.

Underwater Sound Solutions http://www.commonwork.com/action/commons/action/common

#### BII-7780 Series 3D Imaging Transducer

BII-7780 series transducers consist of two rectangular (linear) arrays in "Cross or +" structure with custom-fit along-length beamwidth and cross-length beamwidth for use in location, search of sound sources underwater in in tens meter range, and acoustical imaging in biomedical, oceanography, NDT and material study. Along-length beam can be steered and focused in ±90° range with array beamforming technology.

Two linear phased arrays functions as Target Angle Estimation System with Mills Cross technique. High resolution image can be formed with the technology of Synthetic Aperture Sequential Imaging.





#### 3D Imaging Transducer: Two Linear Phased Array (Rectangular Aperture)



BII-7780 Series Transducer: Two Linear (Rectangular) Phased Array in "Cross" or "+" Structure. The imaging principle is based on Mills Cross technique.

#### **Typical Applications**

Acoustical Imaging & Mapping: C-mode (3D), Diagnostic Ultrasound, NDT Navigation, Target Tracking, Obstacle Avoidance, Positioning, Object Detection

#### Specification

Phased Array	BII-7781
Array Aperture:	Two Linear Arrays (Rectangular) are in orthogonal. The structures of the two arrays are identical.
Major Features:	Narrow Beam along the length of a linear array. Wide beam along the width of a linear array.
Maximum Array Length:	150 mm.
Array Element Number N:	Custom-fit, N is determined by fs, d and -3dB along-Length.
	N = 50.8*C/(fs*d*Along-Length Beamwidth)+1. C: the sound speed in subject, and approximately 1500 m/S in water.
Signal Type:	Pulsed SINE, Chirp, PSK, FSK, Pulsed Square Waveform, CW, etc.
Resonant Frequency fs:	45 kHz to 2 MHz, Custom-fit, and is limited by maximum available array length 150 mm.
Third Harmonic:	2.9fs ~ 3.2fs; Transducers can operate at 3fs.
Quality Factor Q <sub>m</sub> :	$\approx$ 33dB bandwidth = fs/Q <sub>m</sub> .
Element Spacing d:	The distance among the center lines of two neighboring elements. Along Length. Default: $\lambda/2$ or Custom-fit, in mm.
TVR:	> 160 dB µPa/V@1m @ fs. Transmitting Voltage Response.
FFVS:	> -195 dB V/μPa @ fs. Free-field Voltage Sensitivity.
	Sensitivity Loss over Extension Cable (dB) = $20^{10} [C_h/(C_h+C_c)]$ . Ch: Hydrophone Capacitance; Cc: Capacitance of Extension Cable.
	Cable is of 100 pF/meter roughly.
-3dB Beam Width:	Horizontal (Along-length) Plane: 0.1° to 50° at fs. Vertical (Cross-length) Plane: 1° to 50° at fs. Specify with H°xV° when ordering.
	For example, 1°x50° at fs, horizontal beam width 1°, vertical beam width 50°. With Mill Cross, the transducer has 1° x 1° resolution
	and 50° x 50° view field.
Directivity Pattern:	Fan-shaped beam
Steering Beam:	For each linear array: Along-Length: ±90°; Cross-length: No.



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Beamforming:	Electronic beam steering and focusing in the sca	n plane.						
Side Lobe Level:	≤ -15 (dB)							
Free Capacitance:	TBD. To be determined with customization.							
Dissipation:	TBD. To be determined with customization.							
Admittance:	TBD. To be determined with customization.							
Driving Voltage:	1. Default: Maximum 600 Vrms. 2. TBD. To be determined with customization.							
MIPP:	Up to 5000 Watts, custom-fit Maximum Input Pu	ulse Power.						
MPW @ MIPP:	Maximum Pulse Width, TBD. To be determined y	with customization.						
MCIP	Lin to 200 Watts custom-fit Maximum Continuo							
Operating Depth:	Op to 200 wates, custom-ne watering on the continuous input nower.							
operating beptin	1. Default: Free Hanging (FH)							
	2. Thru-hole Mounting with Single O-ring (THSO)							
	3. Thru-hole Mounting with Double O-ring (THDO)							
	4. Bolt Fastening Mounting (Stainless Steel): (BFMSS)							
Mounting Options:	5. End-face Mounting: (EFM)							
	6. Flange Mounting: (FGM)							
	7. Flush mounting: (FSM)							
	Please refer to online document AcousticSystem.pdf for a complete list of Mounting Options and more details.							
	By default, the cable goes out of the device from the end face.							
Cable-Out:	To save space and have the device shorter, the cable can go out of the device from the side wall for uses in air or shallow water							
	(< 50m). Specify when ordering.							
	Each array element has a cable. Cable is numbered: #1. #2, #3,							
Cable:	1. Two Conductor Shielded Cable (SC)							
	2. KG1/4/U COAX 50() (KG1/4) 2. PG178P/U COAX 50 O (PG178)							
Cable Longth:	3. KG1/8B/U COAX 5U (2 (KG1/8)							
	1. Default: 1m. 2. Custom							
	1. Default: Wire Leads (WL)							
	2. Male BNC (BNC) 2. SMA (Blug, Malo Dip) (SMA)							
Connector:	4 SMC (Plug Female Socket) (SMC)							
	Note: Underwater Mateable Connector is for uses underwater. Other connectors and wire leads are for dry uses and are not							
	waterproofed.							
Size:	Maximum available housing size: Φ168mm.							
Weight:	TBD. To be determined with customization.							
Operation Temperature:	1. Default: -10 to +60 °C, or 14 to 140 °F. 2. Custo	omized High Temperature Transducer: -15	5°C to 120°C or 5°F to 248°F.					
Storage Temperature:	-20 °C to +60 °C or -4 °F to 140 °F.							
Tana and a family for a set	1. Default: No built-in temperature sensor.							
Temperature Sensor:	2. Built-in temperature sensor. When ordering, append <b>TS</b> to part number for integrating a temperature sensor in the transducer.							
Impodance Matching:	Order Separately, Not included. Available options of Impedance matching: 2 to 32, 50, 60, 70, 75, or 100 Ω.							
impedance Matching.	Standalone BII-6000 Device: Refer to BII-6000 Impedance Matching between transducers and power amplifiers.							
T/R Switch:	Refer to BII-2100 Transmitting & Receiving Switc	h, Standalone Unit; Not Included. Order S	Separately.					
How to determine pulse wi	dth, duty cycle and off-time with input pulse pow	er (peak power):						
1. Determine the input pulse	e power (IPP, peak power) with sound intensity req	uired by the project. IPP MUST be less the	an MIPP.					
2. Pulse Width ≤ (MIPP * MF	PW*(120°c-T)/103°c)/IPP. T: Water Temperature in	°c.						
3. Duty Cycle $D \le MCIP^*(120)$	)°c-T)/103°c)/IPP.							
4. Off-time $\geq$ PW*(1-D)/D.								
WARNING: DANGER — HIGH	I VOLTAGE on wires. Wires shall be insulated for sa	afety. DO NOT TOUCH THE WIRES BEFORE	THE DRIVING SIGNAL IS SHUT DOWN.					
for EOO BNC Male constants	ieu inniny for safety.	at the (female) RNC chield of the sized of	sures is firmly grounded for exercise					
Tor SOLA BING INTERCONTECTOR, IT IS DUYER'S SOLE RESPONSIBILITY TO MAKE SURE that the (TEMALE) BING Shield Of the Signal Source IS TIRMLY grounded for Operating								
Transducer Wiring	Shielded Cable	Coax/BNC	Coax/Wire Leads					
Driving Signal	White or Red	Center Contact	Coax Center Conductor					
Signal Common	Plack	Chield						
	Diduk Shield Chield							
Shielding	Shield	Shield						
System Grounding	Shiela	BINC Shield	Coax Shield					

How to Order

The structures of transmitting array and receiving array are identical.

Array Spacing d: the distance among the center lines of two neighboring elements.

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Beam Width: The angle of main lobe at -3dB when driving signals to all array elements are identical (f, phase and amplitude are same.).											
Transducer	/fs	-N	-d	-Beam Width	-Mounting	-Cable Length	-Cable	-Connector			
BII-7781	in kHz	Number of elements	Spacing of Elements in mm	H°xV° at fs	Refer to specs.	of Each Element, in meter	Refer to specs.				
Example of Part Number:		Description									

## BII SE=SL-TL+AG-NL

# Benthowave Instrument Inc.

 
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 Underwater Sound Solutions
 http://www.benthowave.com

 BII-7781/100kHz-9-7.5mm-1°x50°-FH-5m-SC-WL
 BII-7781 transducer, fs: 100kHz; Array Elements: 9; Array Element Spacing: 7.5mm; -3dB Beamwidth at fs: 1°x50°; Free Hanging, 2x9x5m Shielded Cable, Wire leads.

Directivity Pattern: illustration ONLY for one of the two identical arrays. Please refer to -3 dB beam width of a specific transducer. Along-length Beam Pattern Along-width or Cross-Length Beam Pattern



