



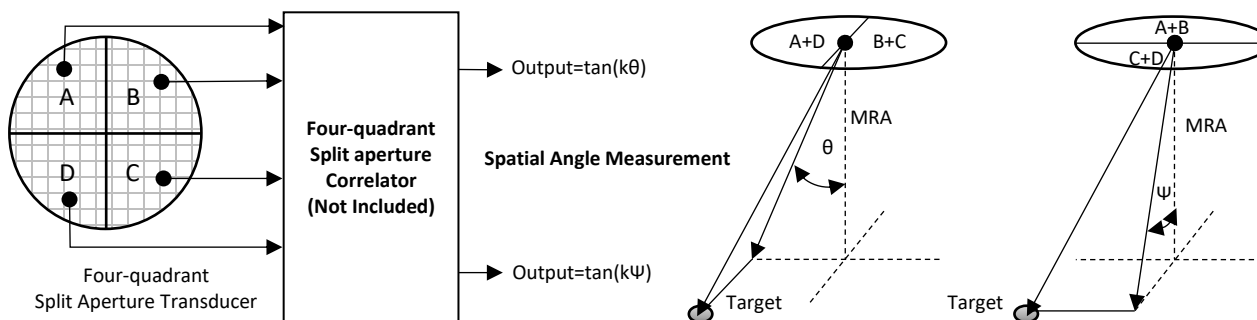
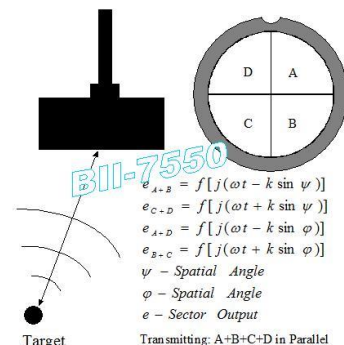
**BII-7550 Series Split Beam Transducer: Target Angle Estimation**

BII's Four-quadrant split beam transducers are designed to estimate bearing and locate underwater targets and support phase extraction or amplitude comparison methods to measure the bearing of the sound sources. That which method is used depends on the signal processing in software/electronic hardware and the signal properties. The quadrant array is separately beam formed. The signals from the direction ( $\Psi, \Phi$ ) will result in the phase contributions to the single-frequency directivity patterns functions of the array. With signal processing technologies, the spatial angle ( $\Psi, \Phi$ ), which can be computed quantitatively, indicates the target direction.

**Transmit:** Four sectors are wired together in parallel to transmit sounds underwater.

**Receive:** Four sectors receive sounds underwater individually as a four quadrants receiver, or 4 sectors are wired together to receive sounds underwater as a single beam receiver.

A four-quadrant split beam transducer (BII-7550 Series) works with a four-quadrant split aperture correlator (**not included**) to estimate the direction of arrival of a plane wave sound (or, measure the spatial angle of the sound) and determine the angular position of the target relative to the acoustic axis of the transducer.



<b>Outputs of Four-quadrant Split aperture Correlator:</b>	<p><math>\tan(k\theta)</math> and <math>\tan(k\psi)</math>.</p> <p><b>K:</b> Angle Sensitivity = Phase Shift/Spatial Angle, transducer's parameter.  <b>kθ</b> is phase difference between segments (A+D) and Segments (B+C);  <b>kψ</b> is phase difference between segments (A+B) and Segments (C+D).  <b>θ and ψ:</b> Spatial Angles of a Sound Source Relative to MRA of the Transducer.  <b>MRA:</b> Maximum Response Axis of Transducers, or <b>Acoustic Axis</b>.</p>
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**Typical Applications**

Underwater Positioning	Measurement of Bearing	Tracking Moving Target	Sea-floor Mapping
Fishery Sounders	Split-Aperture Correlator	Marine Life Assessment	Direction-finding Sonar

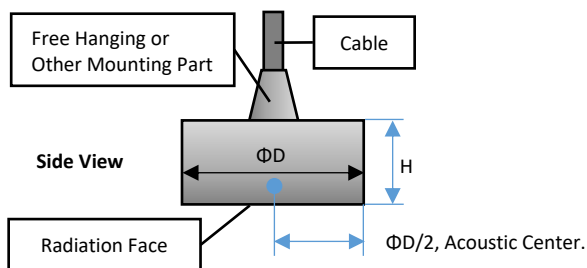
**Specification**

<b>Angle Sensitivity:</b> Phase Shift/Spatial Angle. <b>MIPP:</b> Maximum Input Pulse Power, <b>MCIP:</b> Maximum Continuous Input Power, <b>MPW:</b> Maximum Pulse Width at MIPP.							
<b>Transducer:</b>	BII-7556/38	BII-7556/50	BII-7554/70	BII-7555/70	BII-7556/70	BII-7553/120	BII-7552/200
<b>Signal Types:</b>	Pulse and burst SINE/Square/Chirp excitation.						
<b>Operating Frequency fs:</b>	38 kHz	50 kHz	70 kHz	70 kHz	70 kHz	120 kHz	200 kHz
<b>Quality Factor Q<sub>m</sub>:</b>	3.5	3.5	3.2	3.2	3.2	3.3	3.0
-3dB bandwidth $\Delta f = fs/Q_m$							
<b>Transmit: Sectors A+B+C+D in parallel</b>							
<b>MIPP:</b>	6500W	6700W	2900W	4500W	6500W	1300W	700W
<b>MPW @ MIPP:</b>	50s	40s	28s	28s	28s	16s	10s
<b>MCIP:</b>	65W	80W	45W	60W	95W	30W	20W
<b>Driving Voltage:</b>	Maximum, 600 Vrms. To achieve higher sound level, built-in impedance matching is recommended to step up driving voltage inside the transducer.						
<b>Admittance at fs:</b>	Refer to <b>admittance Graph</b> , or the datasheet with the shipment.						
<b>-3dB Beam Angle at fs:</b>	14.8°	11.3°	12°	10°	8°	9.5°	8.5°
<b>Directivity Pattern:</b>	Conical						
<b>Sidelobes:</b>	One-way: $\leq -17.5$ dB, Two-way: $\leq -35$ dB. <b>Note: Sidelobe suppression is not available.</b>						
<b>TVR (dB <math>\mu</math>Pa/V@1m):</b>	162.0	167.0	166.7	170.5	173.7	169.6	165.3
<b>Sound Level SL:</b>	Maximum SL is determined by maximum driving voltage and MIPP, whichever is less.						
<b>Receive:</b>							
<b>Receiving Array:</b>	Four Quadrants, <b>Sector A, B, C, D, Split Beams</b> .						
<b>Orientation:</b>	A dent mark is on the edge of the outside face. From view of the radiation face, sector A, B, C and D are positioned clockwise and sequentially.						

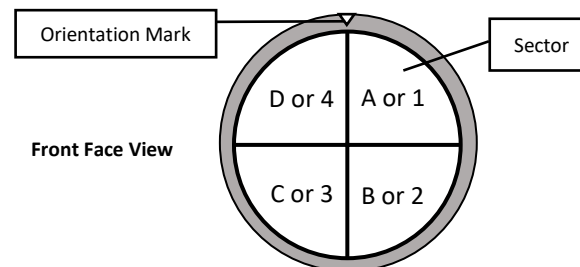
<b>FFVS (dB V/μPa):</b>	-182.6	-185.0	-183.7	-183.5	-183.9	-188.6	-186.3
<b>Angle Sensitivity K:</b>	10.4	13.6	12.7	15.8	19.0	16.4	18.5
<b>Sector Capacitance C<sub>s</sub>:</b>	0.765 nF ±10%	0.828 nF ±10%	0.675 nF ±10%	0.908 nF ±10%	2.1 nF ±10%	0.585 nF ±10%	0.31 nF ±10%
<b>Dissipation:</b>	0.008 at 1 kHz.						
<b>Maximum Depth:</b>	100 m	100 m	100 m	100 m	100 m	100 m	300 m
<b>Mounting Options:</b>	1. Default: Free Hanging (FH) 2. Thru-hole Mounting with Single O-ring (THSO) 3. Bolt Fastening Mounting (Stainless Steel) (BFMSS) 4. End-face Mounting (EFM) 5. Flange Mounting (FGM) Please refer to online document <a href="#">AcousticSystem.pdf</a> for a complete list of Mounting Options and more details.						
<b>Cable:</b>	Cable Bundles with 4 Cables: 1. Four Two-Conductor-Shielded Cables (SC). 2. Four 50 Ω-RG58 Coax (RG58). 3. Customized. <b>Handling: Do not use the cable to support transducer weight in air and water. Do not bend the cable.</b>						
<b>Cable Length:</b>	1. Default: 1 m. 2. Custom.						
<b>Connector:</b>	1. Default: Wire Leads (WL) 2. 50 Ω BNC Male (BNC) 3. Underwater Mateable Connector (UMC) 4. MIL-5015 Style (5015) 5. Custom (custom) Note: Underwater Mateable Connector is for underwater uses. Other connectors and wire leads are for dry uses and are non-waterproof.						
<b>Size (ΦDxH mm):</b>	Φ168x60	Φ168x55	Φ114x50	Φ141x50	Φ168x50	Φ89x36	Φ60x30
<b>Weight:</b>	≥ 2 kg with Four x 10 m cable bundles. Actual weight depends on Mounting Parts, Cable Types and Length.						
<b>Operation Temperature:</b>	-10 °C to +60 °C or 14 °F to 140 °F.						
<b>Storage Temperature:</b>	-20 °C to +60 °C or -4 °F to 140 °F.						
<b>Impedance Matching:</b>	Each sector has its own impedance matching unit. total four impedance matching units are built inside the transducer. BII-6000 Bespoke Impedance Matching between transducers and power amplifiers. Order Separately. Append <b>IM</b> to the part number for integrating BII-6000 in the transducer, and specify impedance in Ω. For example, BII-xxxxIM50Ω: BII-xxxx transducer with four built-in Impedance Matching units and each sector is a 50 Ω load.						
<b>TR Switch:</b>	Standalone BII-2100 Transmitting & Receiving Switch. Not Included. Order Separately.						
<b>Temperature Sensor:</b>	1. Default: No built-in temperature sensor. 2. Built-in temperature sensor. Append <b>TS</b> to part number (BII-xxxxTS) for integrating a temperature sensor in the transducer.						
<b>How to determine pulse width, duty cycle and off-time with input pulse power (peak power):</b>	1. Determine the input pulse power (IPP, peak power) with sound intensity required by the project. IPP MUST be less than MIPP. 2. Pulse Width ≤ (MIPP * MPW*(120°C-T)/103°C)/IPP. T: Water Temperature in °C. 3. Duty Cycle D ≤ MCIP*(120°C-T)/103°C/IPP. 4. Off-time ≥ PW*(1-D)/D.						
<b>WARNING: DANGER — HIGH VOLTAGE on wires. Wires shall be insulated for safety. DO NOT TOUCH THE WIRES BEFORE THE DRIVING SIGNAL IS SHUT DOWN. Cable shield must be grounded firmly for safety.</b> <b>for 50Ω BNC Male connector, it is buyer's sole responsibility to make sure that the (female) BNC shield of the signal source is firmly grounded for operating safety before hooking up transducer/hydrophone to the signal source. Coax with BNC is not intended for hand-held use at voltages above 30Vac/60Vdc.</b>							
<b>Transducer Wiring:</b> The four cables are labelled with "1" for Sector A, "2" for Sector B, "3" for Sector C, "4" for Sector D.							
<b>Wiring:</b>	<b>Two Conductor Shielded Cable</b>	<b>Coax/BNC</b>	<b>Underwater Connector</b>	<b>MIL-5015 Connector</b>			
<b>Signal</b>	White or Red	Center Contact	Contact 2	Contact C			
<b>Signal Common</b>	Black	Shield	Contact 1	Contact B			
<b>Shielding and Grounding</b>	Shield	Shield	Contact 3	Contact A			

**Physical Size (Dimensional Unit: mm):** The overall length varies with the length of mounting parts. Please refer to online information of mounting options.

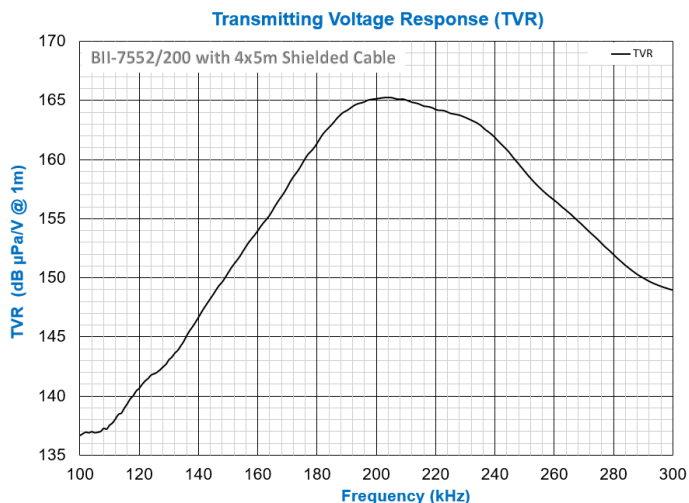
**Free Hanging**



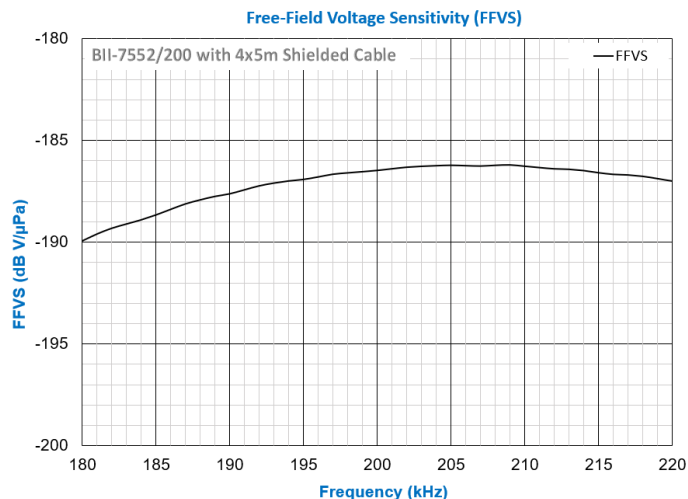
**Orientation of Sectors A, B, C, D or 1, 2, 3, 4.**



**Transmitting Voltage Response (TVR) (A, B, C, D sectors are in Parallel):**



**Free-field Voltage Response (FFVS) of Sector A, B, C, or D:**



**Admittance in Water (A, B, C, D sectors are in Parallel):**

