

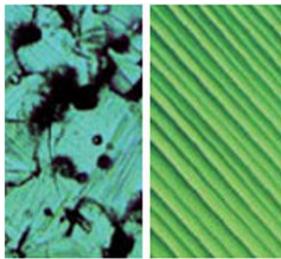
PureWave Transducer Technology



Transducer technology for the whole body

The piezoelectric material in an ultrasound transducer is a fundamental determinant of system image quality. However, despite many innovations in signal processing and beamformer architecture over recent decades, the same piezoelectric material – PZT (lead-zirconatetitanate) ceramics or PZT-composites – has been used for medical imaging for more than 40 years. The typical ceramic material achieves 70% polarization.

That changed with Philips' development of PureWave crystal technology, a new transducer technology using piezocrystals that exhibit a quantum improvement in electromechanical coupling and strain levels. Compared to PZT ceramics, PureWave crystals are purer, more uniform, have lower losses, and are able to transfer energy with greater precision and efficiency.



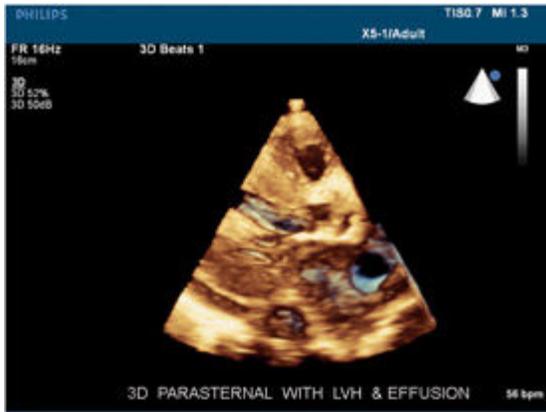
Conventional PZT ceramics (as shown to the left) are made up of randomly oriented grains, while PureWave crystals (shown at the right), have a virtually perfect atomic level arrangement and uniform consistency throughout the material.

With PureWave crystals, fine ceramic powder is formed using a process similar to PZT powders. The powder is melted into a liquid at 1400° C. A seed crystal is pulled away from the melting zone and the crystal is enlarged layer by layer to form a homogeneous crystal boule. The boule is sliced into wafers and polarized prior to slicing into imaging elements.

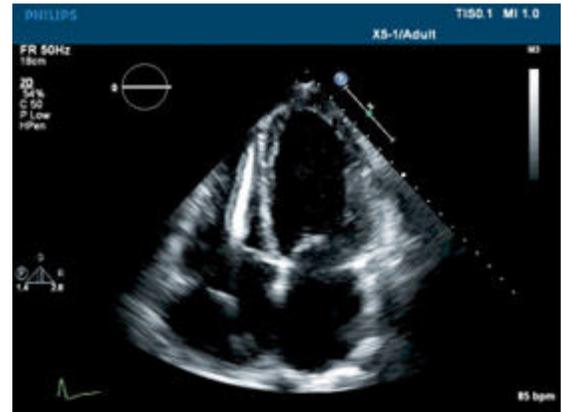
To create an overall piezoelectric effect, materials such as PZT ceramics must be subjected to a poling process where an external electric field is applied to align dipoles within the polycrystalline material. In conventional PZT ceramics, only a fraction of the dipoles can be aligned by electric fields, and not all dipoles contribute to the acoustic response of the material. PureWave crystals are more uniform with fewer defects, lower losses and no grain boundaries. When PureWave crystals are poled, nearly perfect alignment of dipoles can be achieved, resulting in dramatically enhanced electromechanical properties.

By combining PureWave crystal technology with precisely engineered matching layers and backing material, it is now possible to provide frequency coverage from a single transducer that was previously only attainable from two transducers. This new class of piezoelectric crystals significantly improves efficiency in bandwidth compared with conventional PZT ceramics, and results in images of remarkable clarity and detail with greater uniformity throughout the entire sector.

PureWave crystal technology also supports advanced harmonics. Due to the extraordinary bandwidth of these arrays, multiple harmonic frequencies can be utilized providing breakthroughs in resolution and artifact reduction while maintaining superb penetration.



Live 3D imaging enables clear visualization of thickened ventricular cardiomyopathy and pericardial effusion, while also providing valve, chamber and muscle detail.



Even in technically difficult heart failure studies, the myocardium and endocardium are displayed with superb detail and contrast resolution from the apex to the atria.

PureWave benefits:

- › Highly accurate anatomical data
- › Increased diagnostic confidence
- › Increased productivity