Seminar Agenda

• Overview of CHIRP technology compared to traditional fishfinder technology – What’s different?
• Importance of proper transducer selection & installation
• Maximize the performance of your electronics system
• Give feedback, offer product suggestions, and ask tough transducer questions
Traditional “Toneburst” Fishfinder

- Traditional fishfinders operate at discrete frequencies such as 50kHz and 200kHz.

- This limits depth range, range resolution, and ultimately, what targets can be detected in the water column.
Fish Imaging at Different Frequencies

LF 33-60 Khz

70Khz 60Khz 50Khz 40Khz 30Khz
Koden CVS-FX1 at 4 Different Frequencies
Range Resolution Comparison

Conventional sonar

ClearPulse™ CHIRP Sonar
Toneburst with separated targets
Toneburst w/out separated targets
CHIRP without separated targets
Traditional “Toneburst” Fishfinder

- Traditional sounders operate at discrete frequencies such as 50kHz and 200kHz.

- This limits resolution, range and ultimately, what targets can be detected in the water column.

- Tone burst transmit pulse may be high power but very short duration. This limits the total energy that is transmitted into the water column.
CHIRP

A major technical advance in Fishing
What is CHIRP?

• CHIRP has been used by the military, geologists and oceanographers since the 1950’s
• Marine radar systems have utilized CHIRP technology for many years
• This is the first time that CHIRP technology has been available to the recreational, sport fishing and light commercial industries….. and at an affordable price
CHIRP Starts with the Transducer

- AIRMAR CHIRP-ready transducers are the enabling technology for manufacturers designing CHIRP sounders.

- Only sounders using AIRMAR CHIRP-ready transducers can operate as a true CHIRP system.
CHIRP is a technique that involves three principle steps

1. Use *broadband* transducer (Airmar)

2. Transmit CHIRP pulse into water

3. Processing of return echoes by method of pattern matching (pulse compression)
1. Use of a *broadband* transducer (Airmar)

What is bandwidth?
Why is it important?
The graph illustrates the sound amplitude per drive volt against the frequency in kHz. It compares two types of sound systems:

- **B260 Non-Broadband** operating at 50 & 200 kHz.
- **B265LH FM & CHIRP** with a next-generation frequency range of 42-65 kHz and 130-210 kHz.

The graph highlights:

- A 80 kHz band around 175 dB for the B265LH FM & CHIRP.
- A 1 kHz band around 170 dB for the B260 Non-Broadband.

The graph's vertical axis represents the sound amplitude per drive volt in dB, while the horizontal axis shows the frequency in kHz.
Target detection
CHIRP is a technique that involves three principle steps

1. Use broadband transducer (Airmar)

2. Transmit CHIRP pulse into water
Transmit pulse is only at one discrete frequency. The short pulse limits *the total energy* that is transmitted into the water column.

CHIRP sounders use a precise sweep pattern of many frequencies (i.e., 28-60 kHz or 130-210 kHz). Requires a long duration transmit pulse in order to sweep through all of the frequencies.

In order to send a CHIRP pulse, the transducer **MUST HAVE BANDWIDTH**
Benefits to YOU...

• Toneburst fishfinders only send out a waveform at one frequency.

• If a long pulse is used at one frequency, you will lose resolution. Multiple fish will get lost in the long pulse and can not be distinguished.
Benefits to YOU...

• The long transmit CHIRP pulse transmits more energy in the water column
  – Up to 10-1000 times more energy on target!
    • Will get different echo returns from all of the frequencies transmitted – which are then processed and shown on the display.
  – Ability to sound deeper – (more amplitude)
What else is different?

• The CHIRP sound wave that is transmitted is stored in memory
  – Sounder knows the frequency band and pulse length that was transmitted
  – The sounder listens for the return echo, and will match the echo received by the transducer with the reference wave form.
  – AKA: Pattern Matching or Correlation
CHIRP is a technique that involves three principle steps

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Incoming echo

Reference pulse

replica of drive pulse
Pattern Matching
Pattern Matching
Pattern Matching
Pattern Matching
Pattern Matching
Pattern Matching
Pattern Matching
Pattern Matching
Pattern Matching
Pattern Matching

... etcetera
Procedure for Pulse Compression

Shift, Multiply and Add

calculation performed by computer
Reference pulse

Incoming echo

replica of drive pulse

Correlation
Pulse Compression

Correlation
Pulse Compression

Correlation
Pulse Compression

Correlation
Pulse Compression

Correlation
Pulse Compression

Correlation
Pulse Compression

Correlation
Pulse Compression

Correlation
Pulse Compression

Correlation
Why is pattern matching (pulse compression) important?

Significantly improved signal to noise ratio
  – Noise does not correlate with the stored waveform
  – Ability to pull targets from the noise floor
  – Bottom tracking at high speed and deep depths

Resolution
  – Resolve individual targets – no blobs
  – Crisp images
Is a CHIRP system for YOU?

Advantages versus Disadvantages
CHIRP: Many advantages when the conditions are challenging

- Operating in a noisy environment
CHIRP: Many advantages when the conditions are challenging

- Operating in a noisy environment
- When detailed resolution is needed to separate individual fish (range resolution)
Tuna working on baitfish

R599LH & BSM2
Canary Islands – High CHIRP

Same big eye tuna found the shoal of mackerel and started working on them

Gain has been turned down from left to right
CHIRP: Many advantages when the conditions are challenging

- Operating in a noisy environment
- When detailed resolution is needed to separate individual fish (range resolution)
- Crisp images
Crisp, detailed images
Accurate detection – Target separation

- Thermocline
- Gamefish
- Gamefish school
- Baitfish

AIRMAR® Technology Corporation
Sensing Technology
DEEPER. BROADER. CLEARER.
CHIRP: Many advantages when the conditions are challenging

- Operating in a noisy environment
- When detailed resolution is needed to separate individual fish (range resolution)
- Crisp images
- Bottom fishing – resolve targets close to the bottom or near structure
Gain: Large Fish on Medium CHIRP

Two large fish targets clearly separated from each other over the bait

Gain at 91%

R109LM and GSD26 Scotland
Incredibly sharp fish targets with separation even in the dense shoals.

Baitfish detached from the main bottom signal return.

Minimal ring-down resulting from a low Q.
CHIRP: Many advantages when the conditions are challenging

• Operating in a noisy environment
• When detailed resolution is needed to separate individual fish (range resolution)
• Crisp images
• Bottom fishing – resolve targets close to the bottom or near structure
• Searching for fish at high boat speeds
CHIRP: Many advantages when the conditions are challenging

- Operating in a noisy environment
- When detailed resolution is needed to separate individual fish (range resolution)
- Crisp images
- Bottom fishing – resolve targets close to the bottom or near structure
- Searching for fish at high boat speeds
- Tracking bottom at deep depths
More advantages

• One transducer can offer offer 117 kHz of selectable frequencies
  – Can I use a CHIRP transducer with a non-CHIRP sounder?
• Significant resolution improvements at low frequency
• More energy on target
• Up to 1,000 times greater sensitivity than traditional fishfinders
Things to remember - disadvantage

• Keep in mind – the display is limited by the available pixels.
  – The deeper the depth, the less pixels available to show details is in the water column.
  – CHIRP is able to show fine resolution/detail
  – If too much range, the images will be limited by the resolution of the display
    • Get a bigger monitor! (details will be lost)