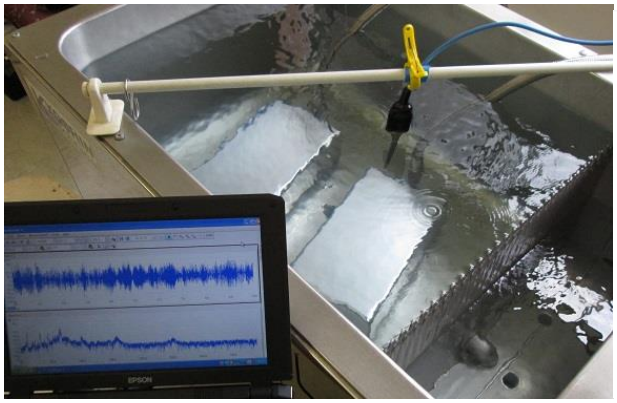
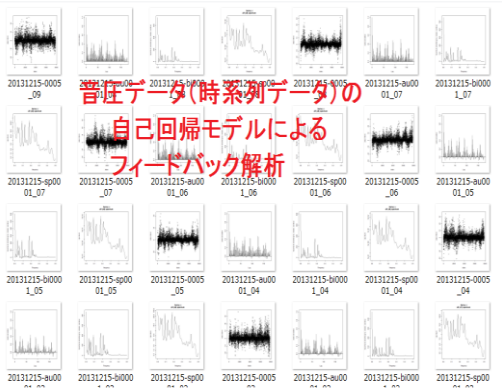
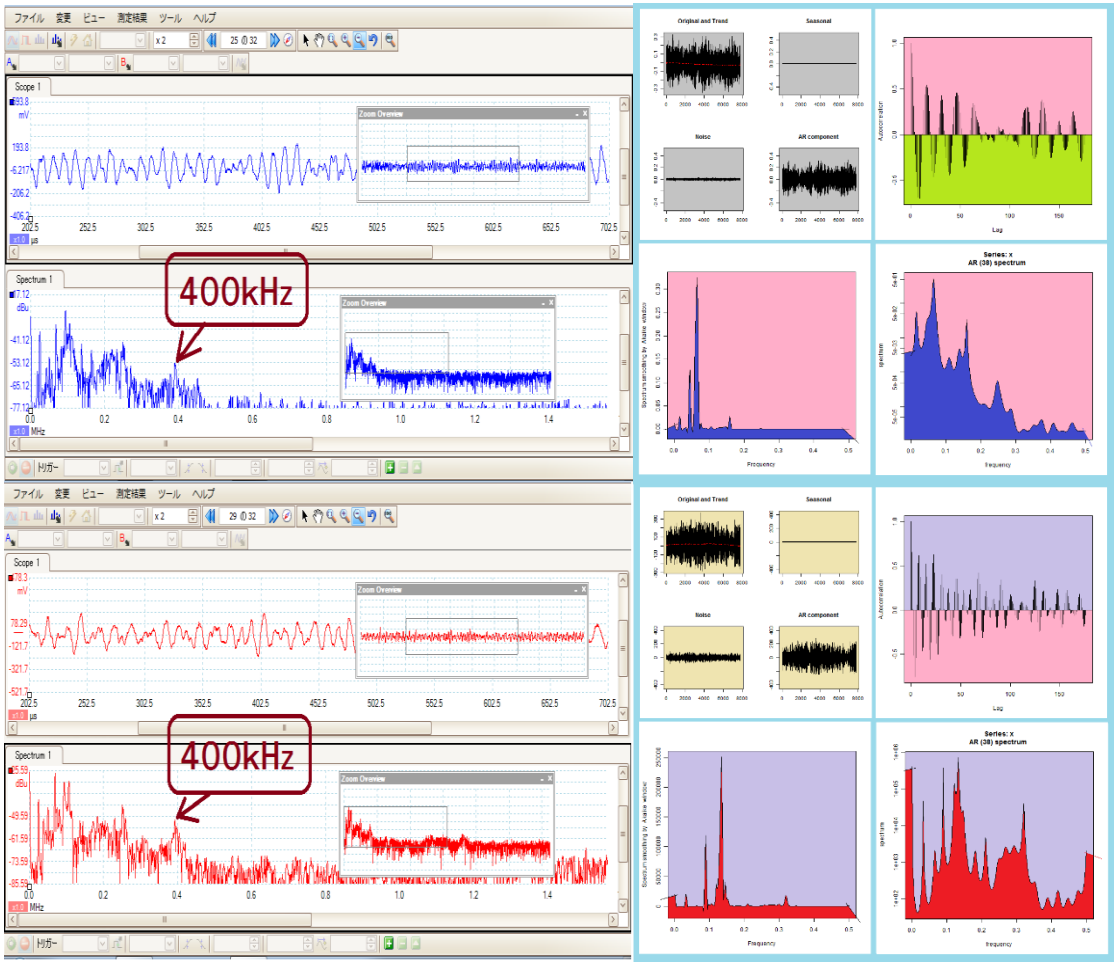
超音波技術（R言語）

超音波の音圧測定解析事例　No.2





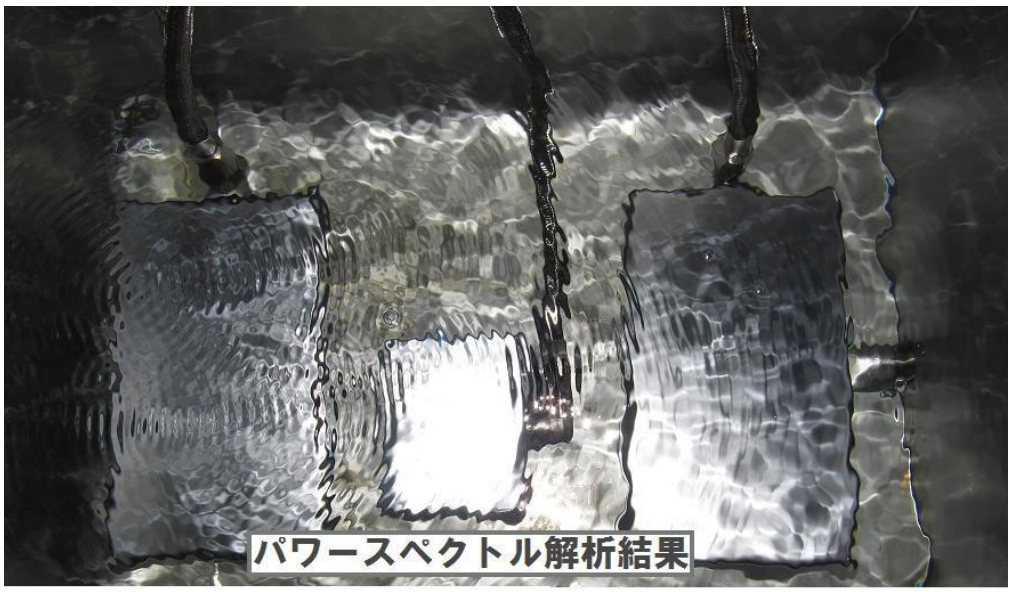
音圧測定解析

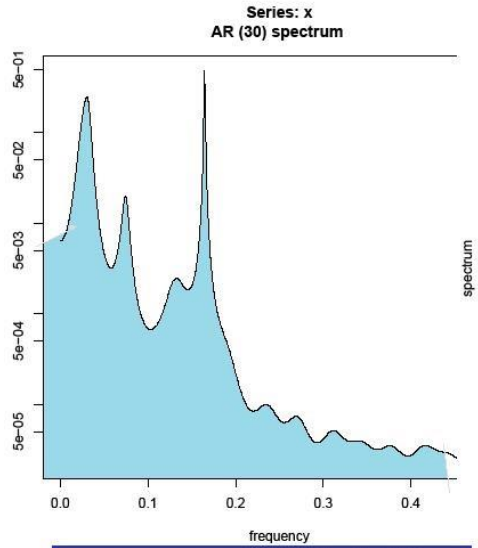


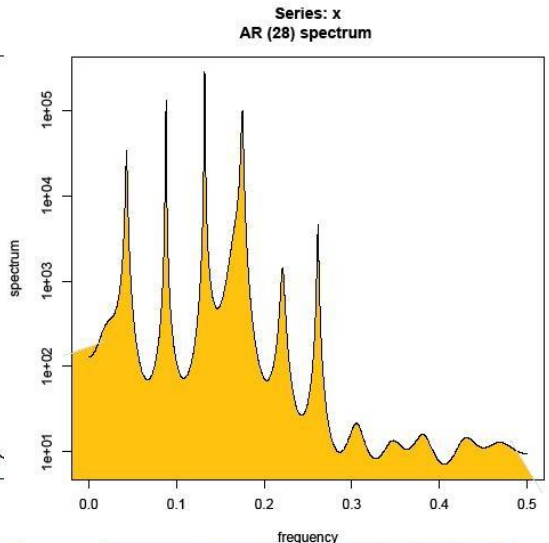
音圧測定解析結果

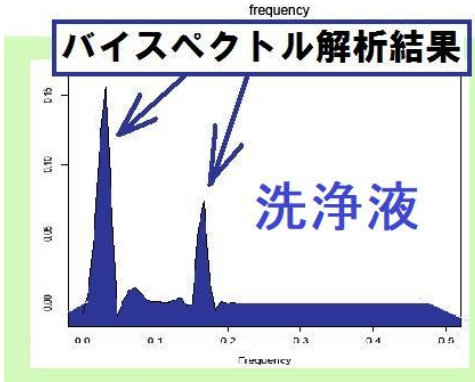
超音波システム研究所

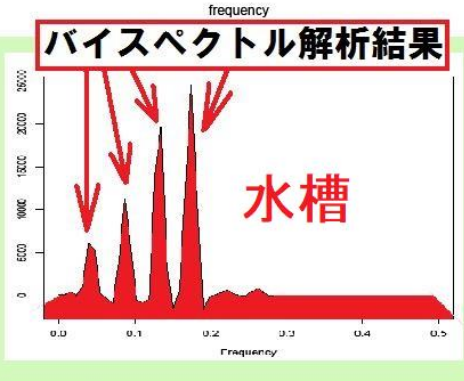
音圧測定解析実験



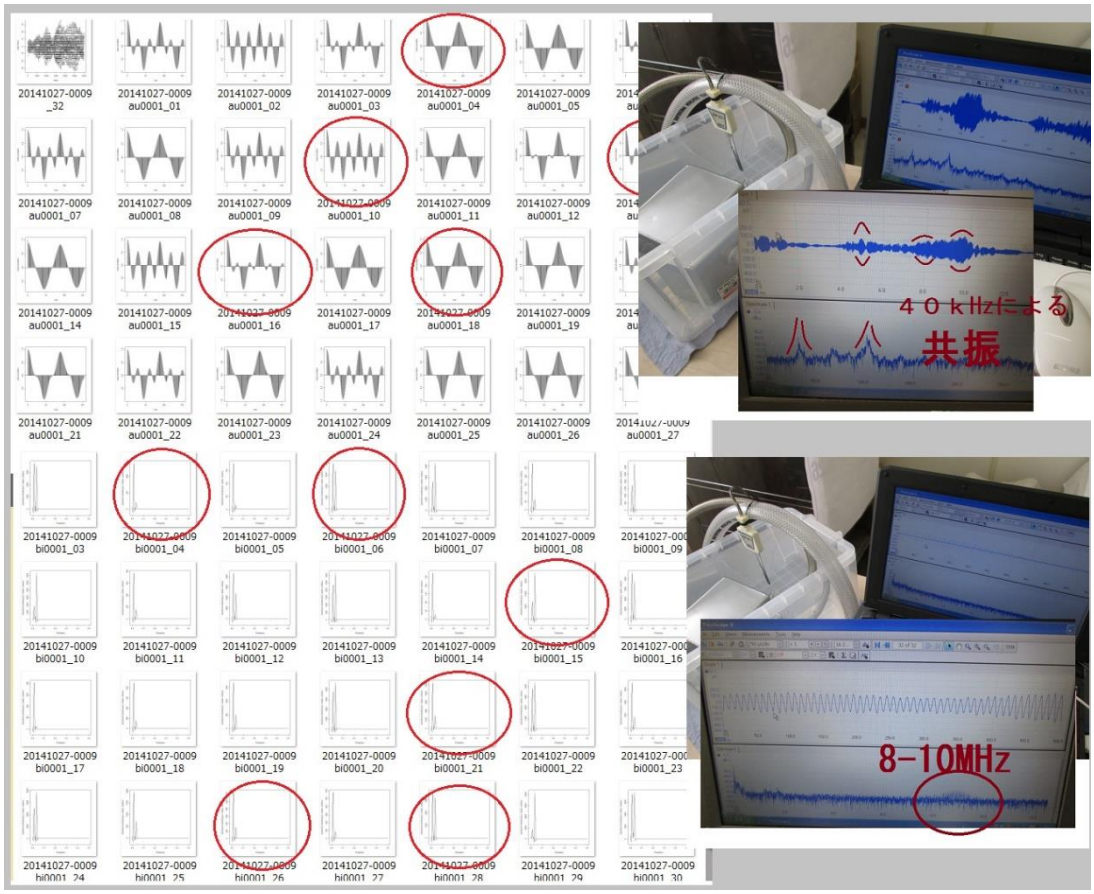


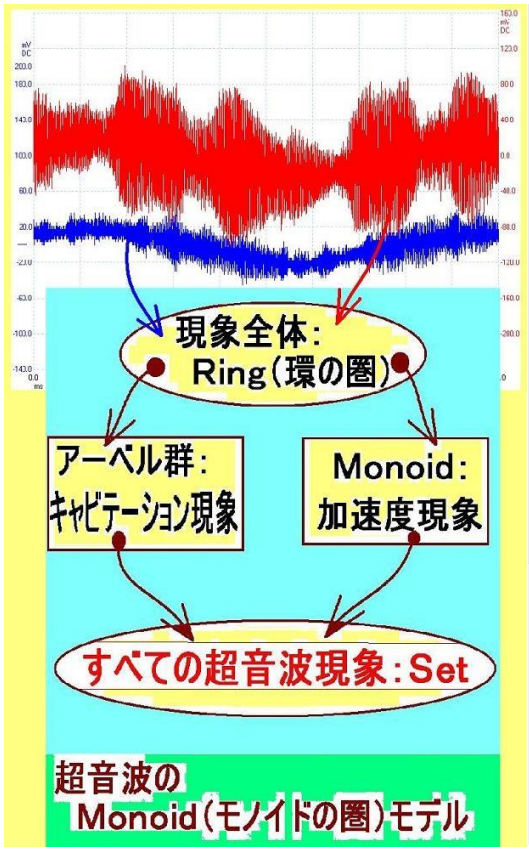


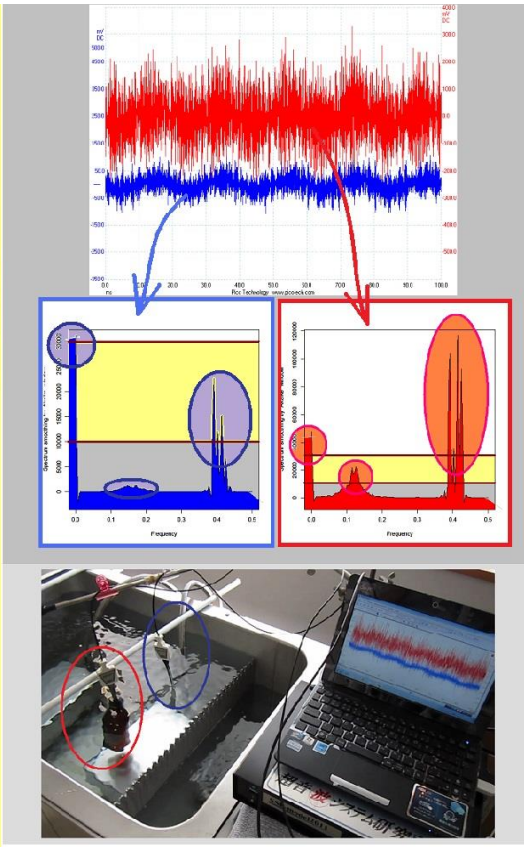




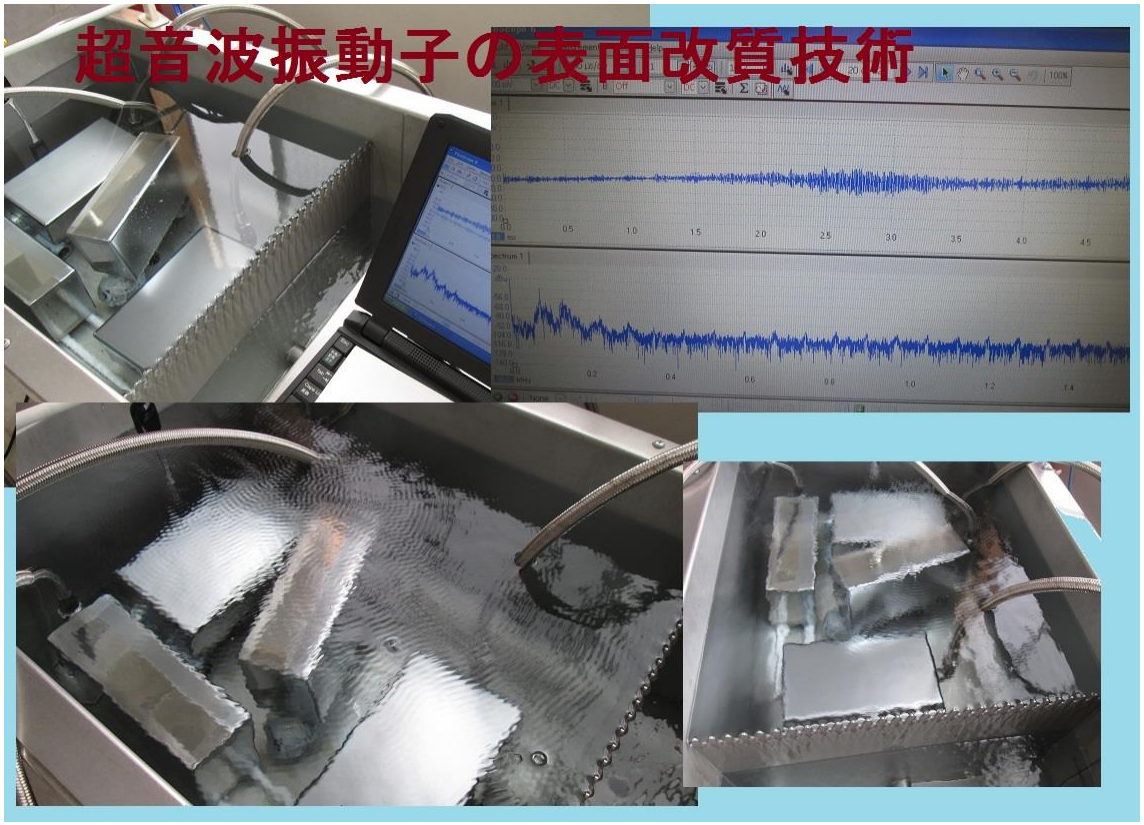
非線形現象の利用
（応用・解析・制御）技術


４０kHzによる
八　八　共振
8-10MHz

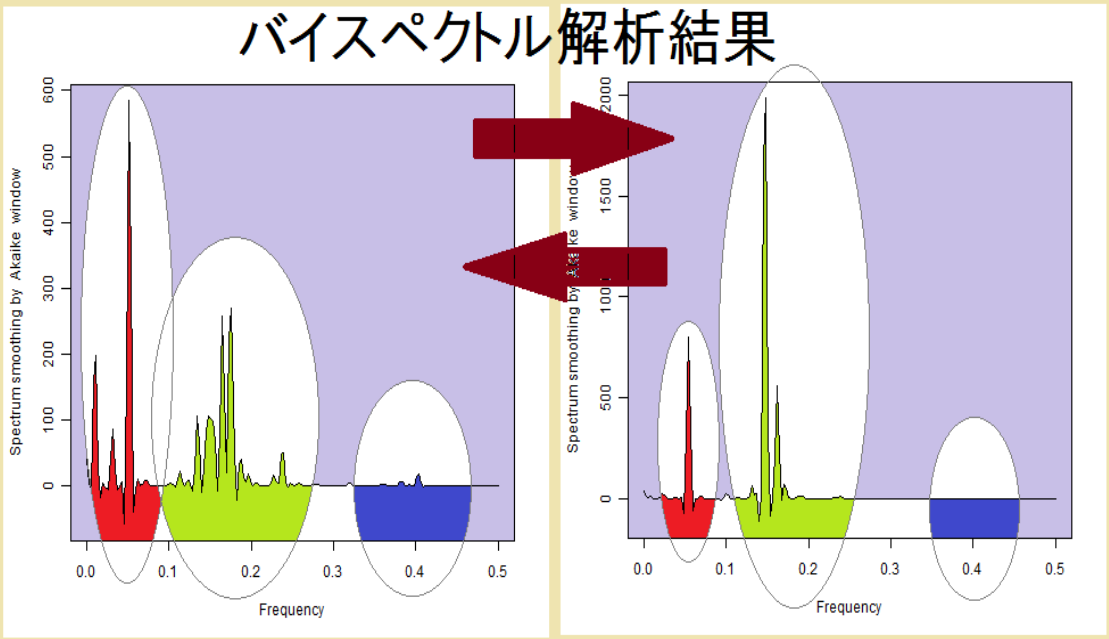

現象全体：
Ring（環の圏）
アーベル群：
キャビテーション現象
Monoid：
加速度現象
すべての超音波現象：Set
超音波の
Monoid（モノイドの圏）モデル



超音波振動子の表面改質技術

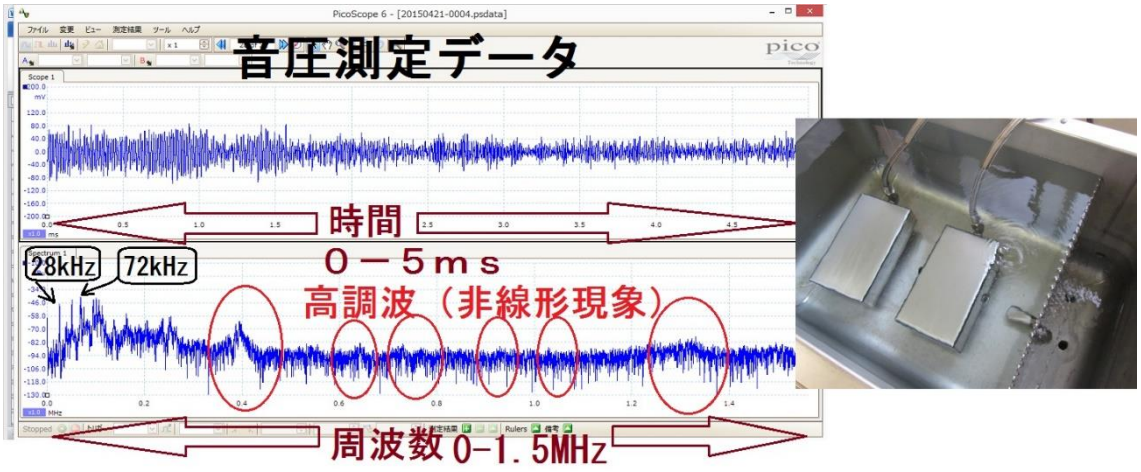


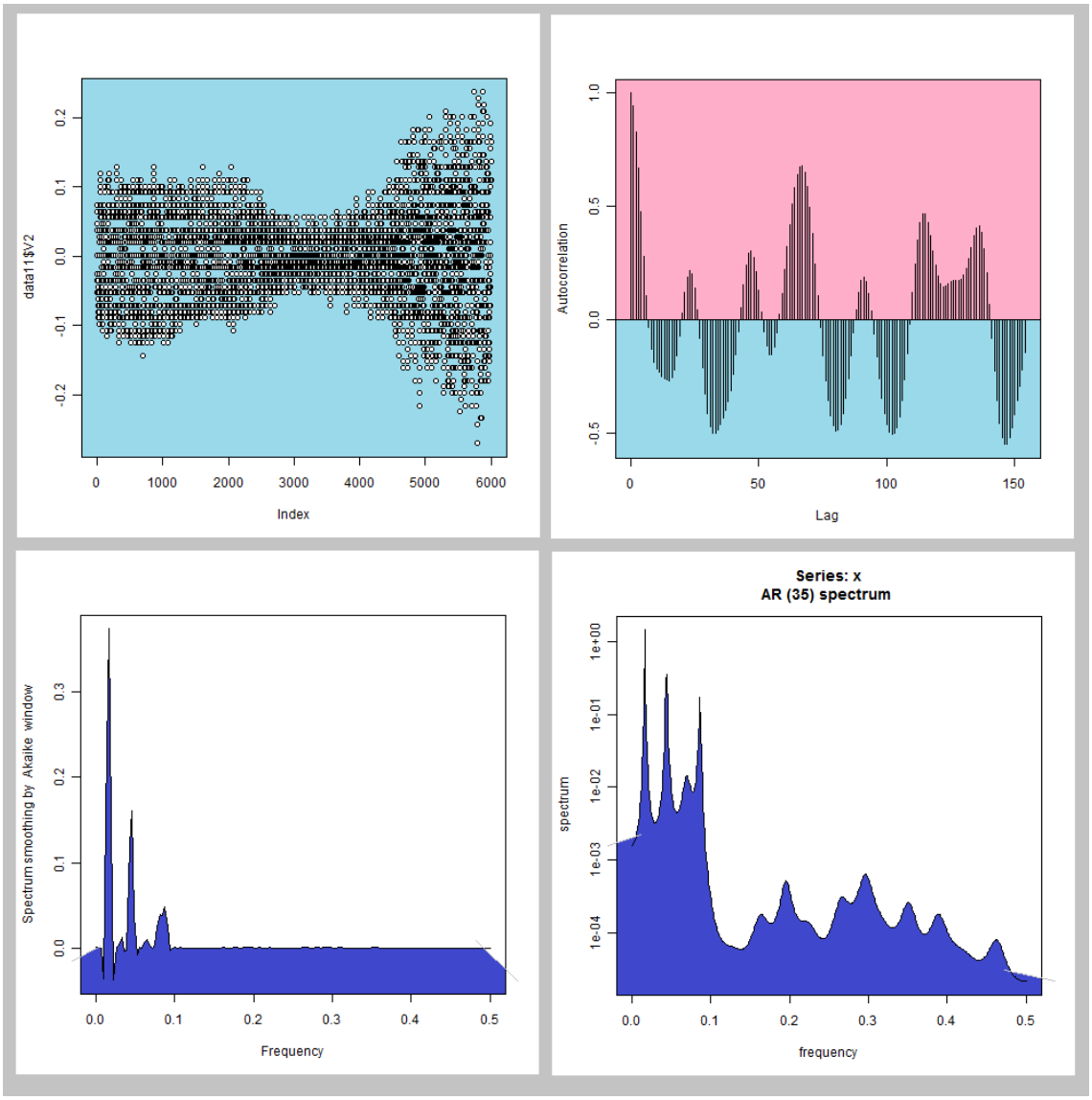
バイスペクトル解析結果

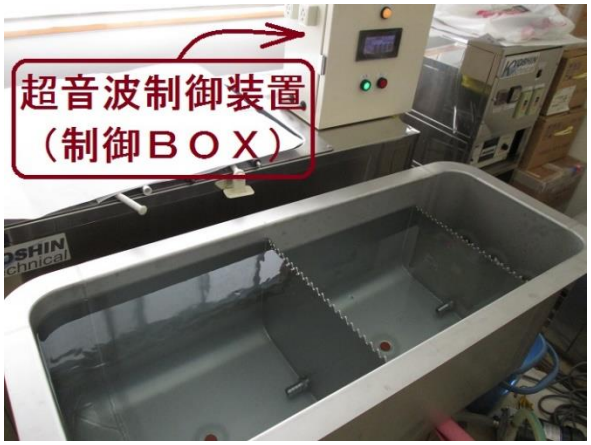


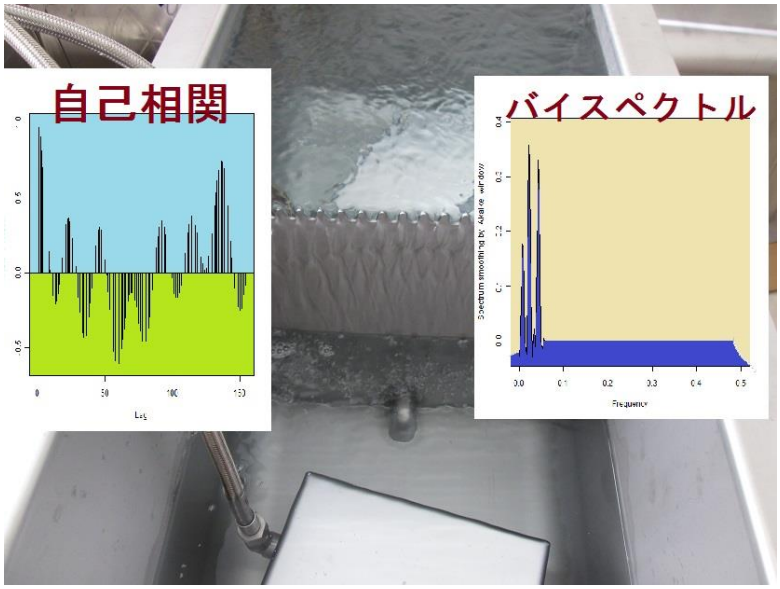
ダイナミック制御

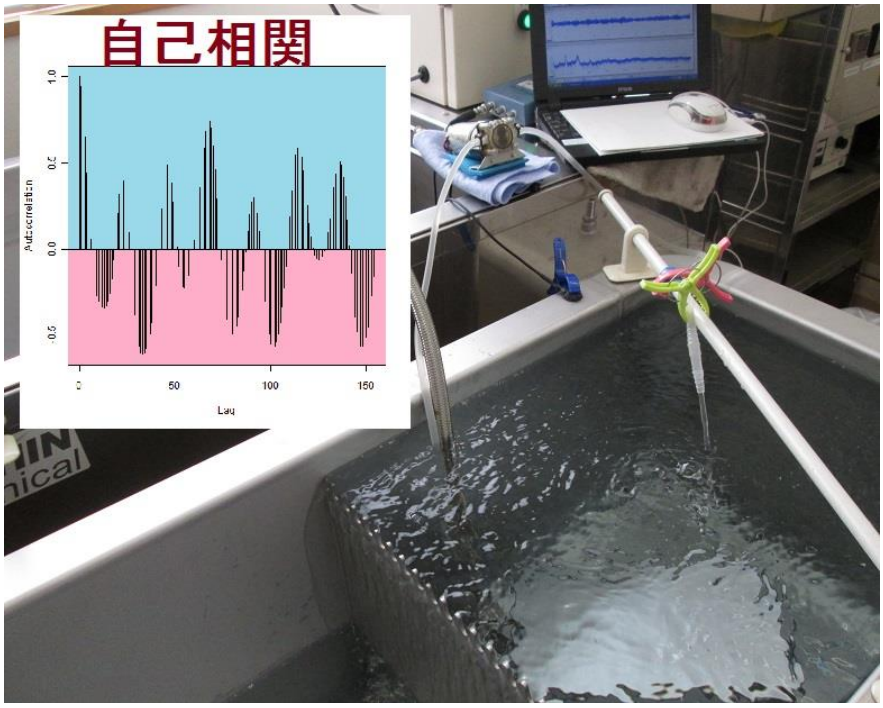
目的に合わせた伝搬周波数のコントロール技術

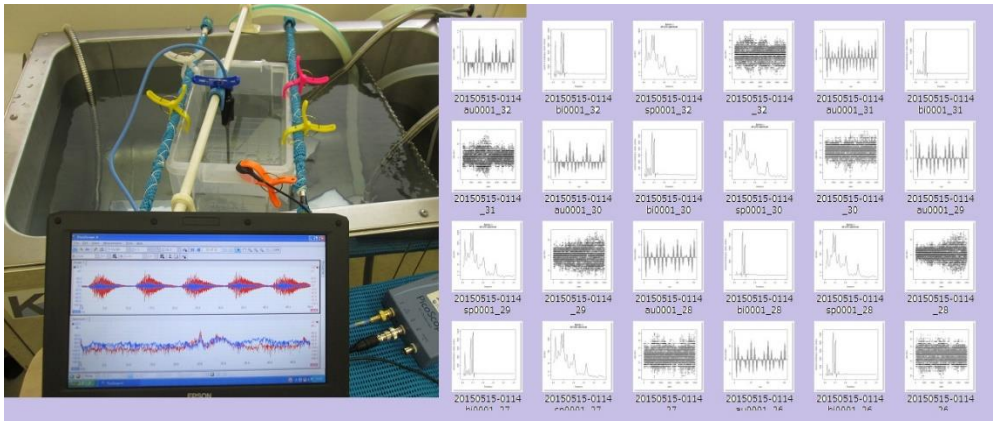

音圧測定データ
時間
0－5ｍｓ
高調波（非線形現象）
28kHz
72kHz
周波数0-1.5MHz

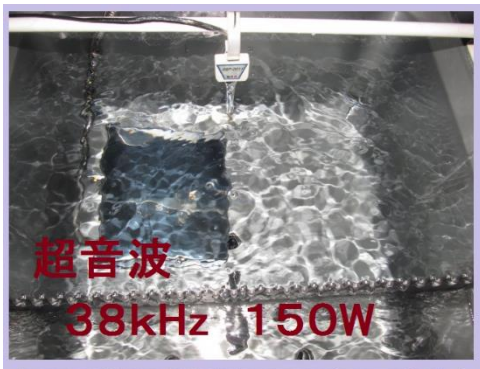

data11$V2
Index
Autocorrelation
Lag
Spectrum smoothing by Akaike window
Frequency
Series: x
AR (35) spectrum
spectrum
frequency

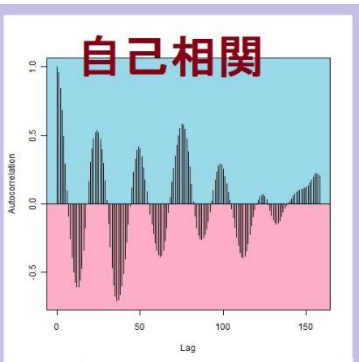

超音波制御装置
（制御ＢＯＸ）

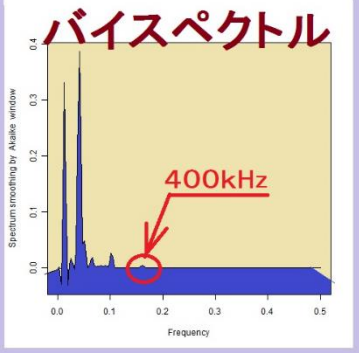

自己相関
バイスペクトル

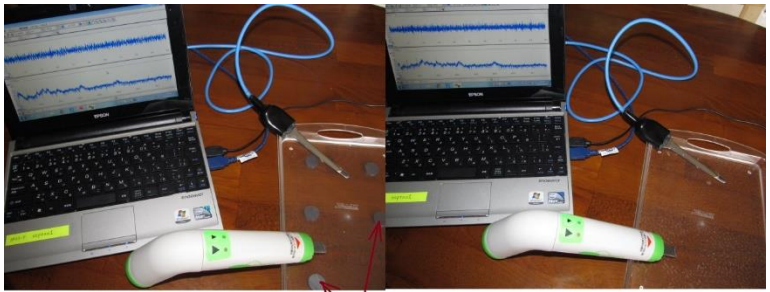

自己相関

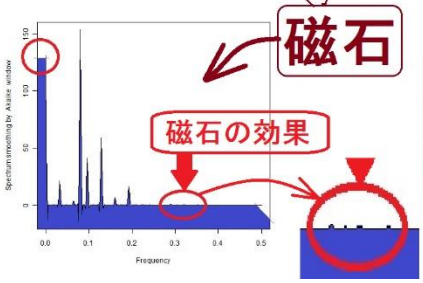


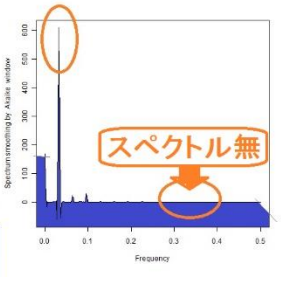

超音波
38kHz 150W


自己相関
Autocorrelation
Lag

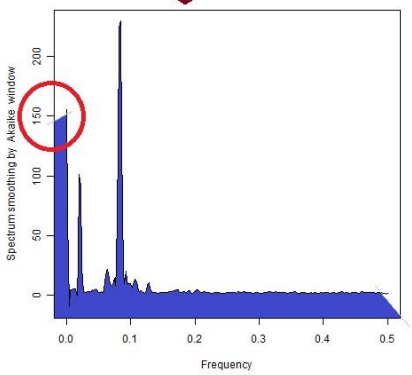

バイスペクトル
400kHz
Spectrum smoothing by Akaike window
Frequency

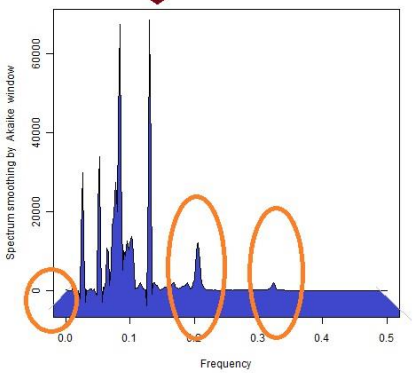


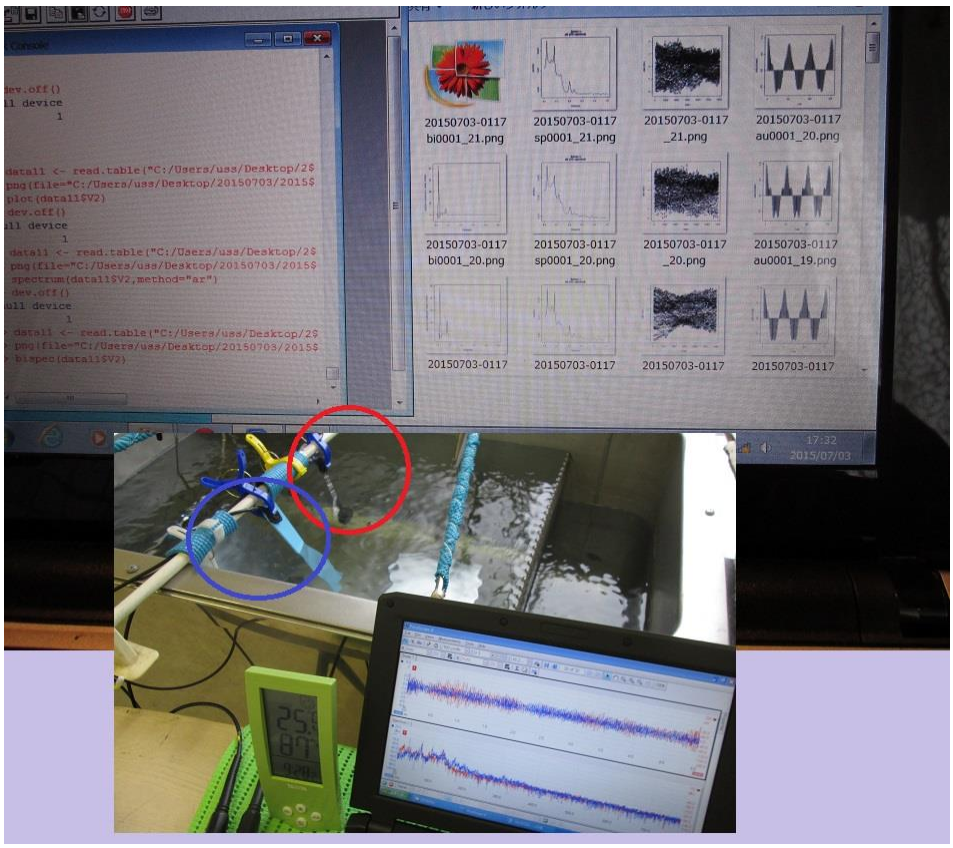

磁石
磁石の効果
Spectrum smoothing by Akaike window
Frequency


スペクトル無
Spectrum smoothing by Akaike window
Frequency


ガラス容器の
相互作用

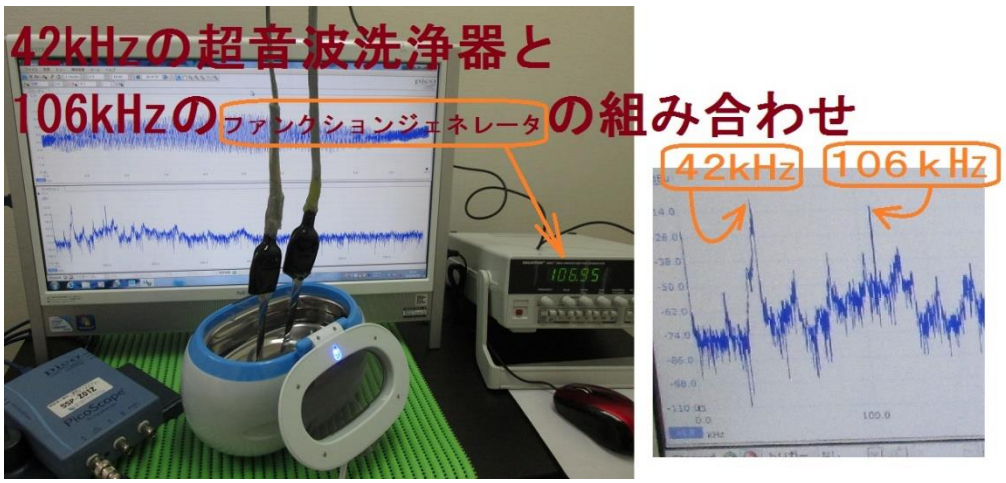

Spectrum smoothing by Akaike window
Frequency

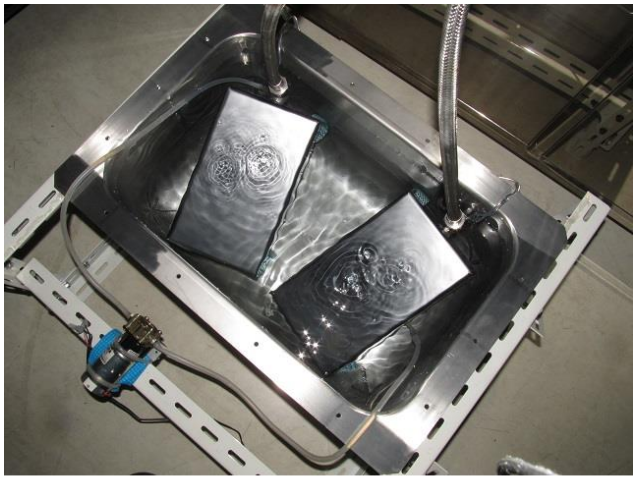

Spectrum smoothing by Akaike window
Frequency


20150703-0117 bi0001_21.png
20150703-0117 sp0001_21.png
20150703-0117 _21.png
20150703-0117 au0001_20.png
20150703-0117 bi0001_20.png
20150703-0117 sp0001_20.png
20150703-0117 _20.png
20150703-0117 au0001_19.png

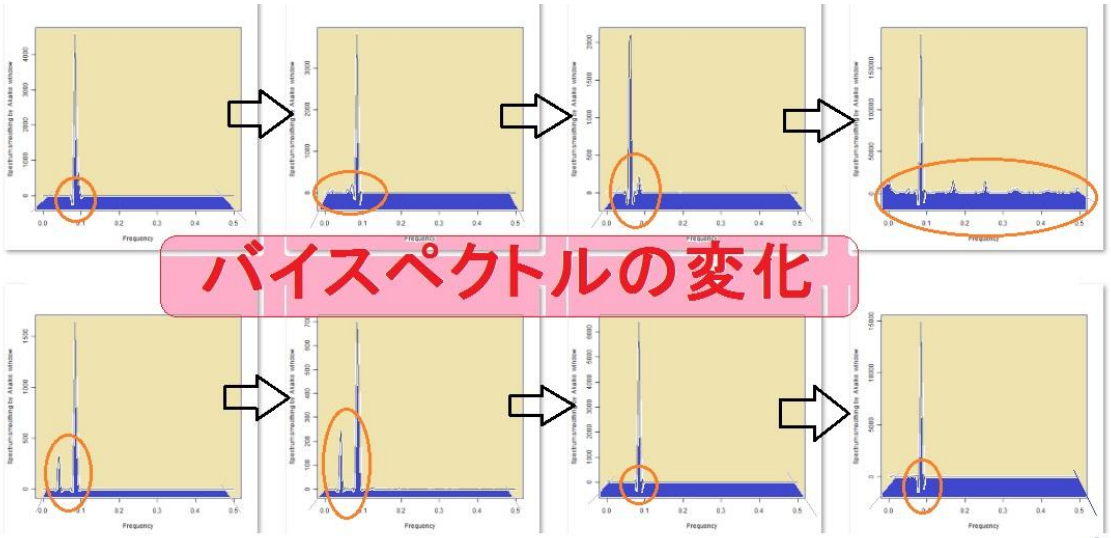

流水式超音波システム
（音響流のコントロール技術）
バイスペクトル
（解析結果）

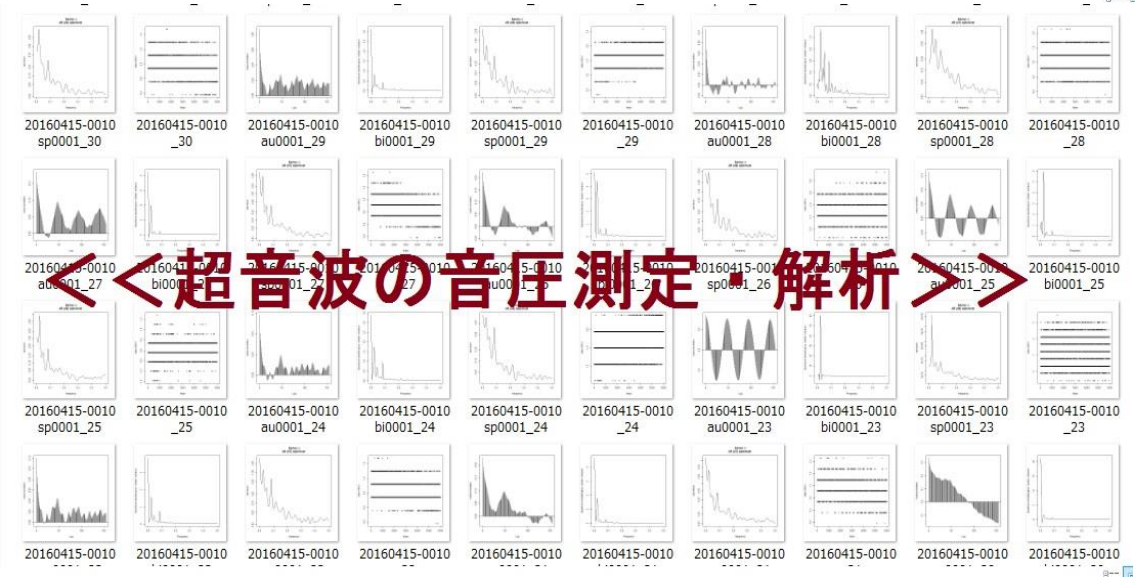

20151103-0026bi0001_13
20151103-0026bi0001_14
20151103-0026bi0001_15
20151103-0026bi0001_16


42kHzの超音波洗浄器と
106kHzの
ファンクションジェネレータ
の組み合わせ
42kHz
106kHz

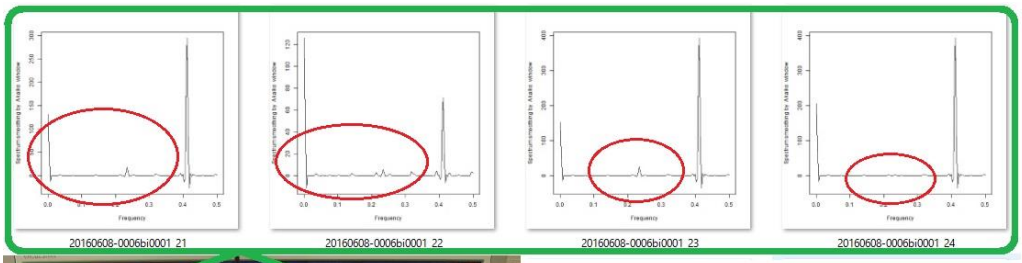


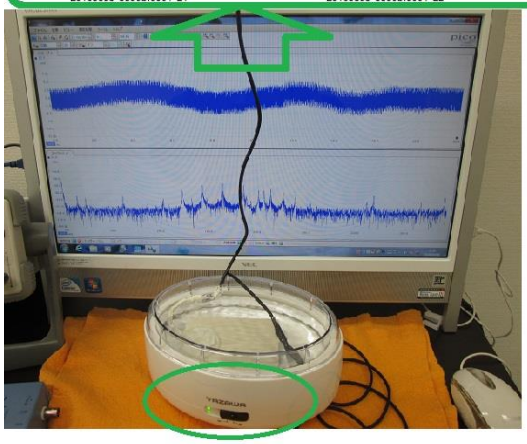
小型脱気マイクロバブル発生
液循環システム

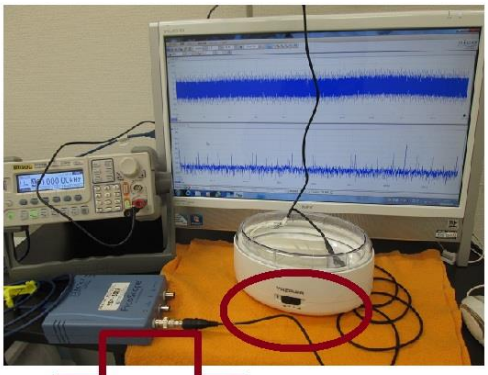


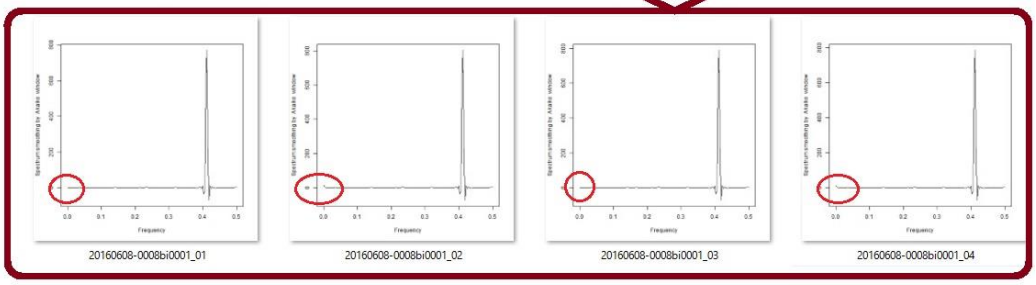


＜＜超音波の音圧測定・解析＞＞

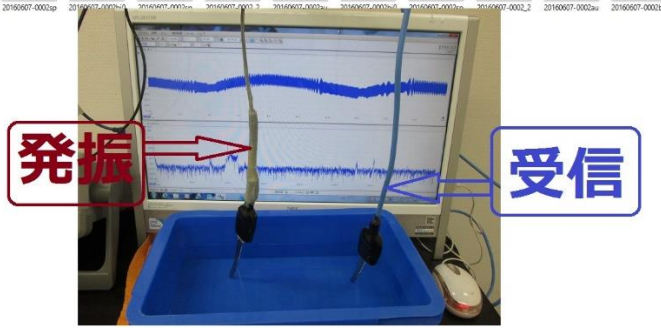


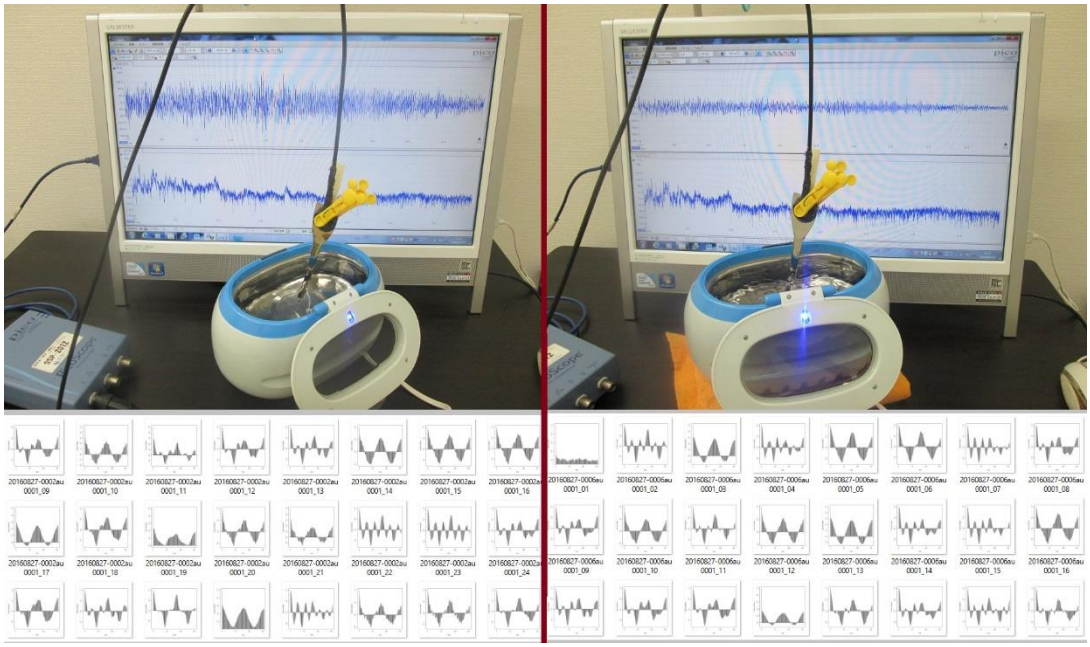


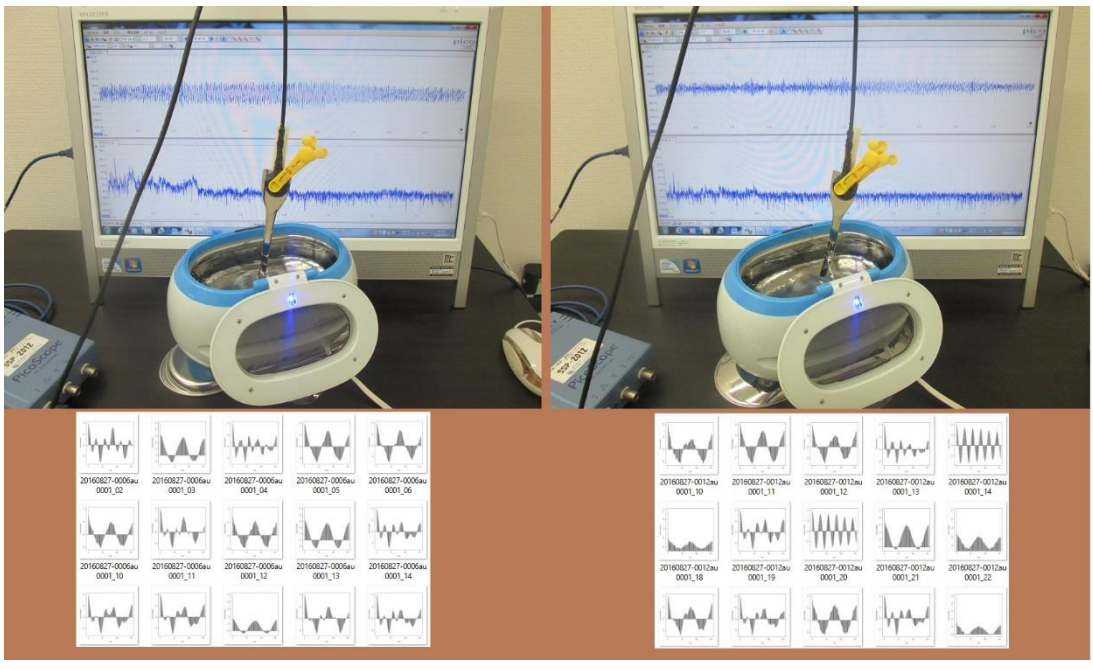


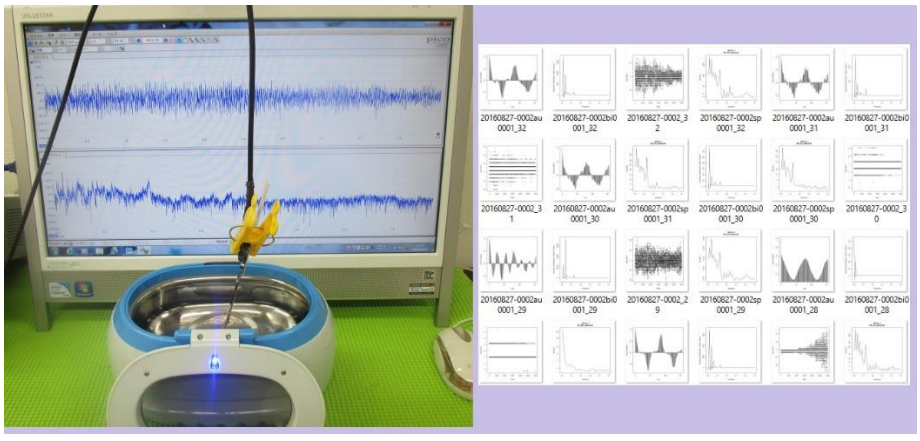


<超音波制御ノウハウデータ>

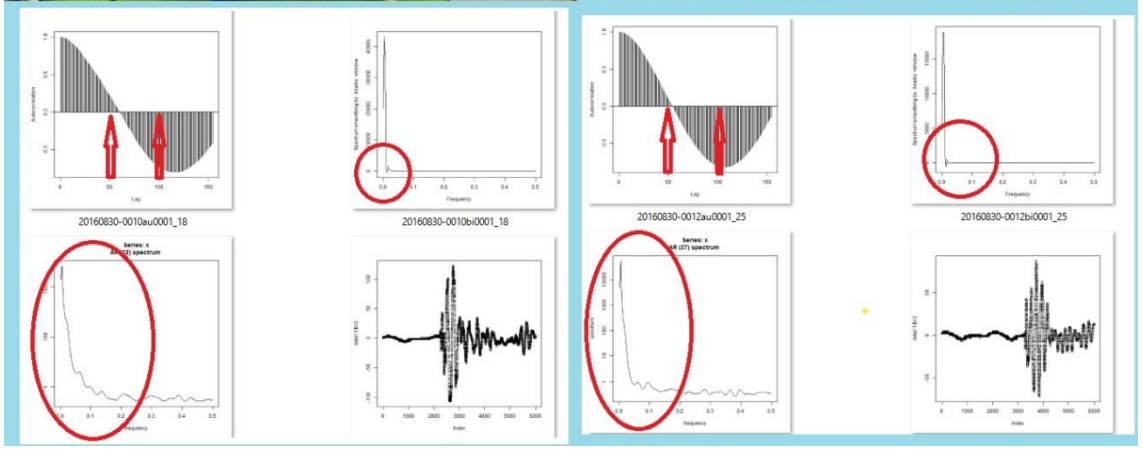


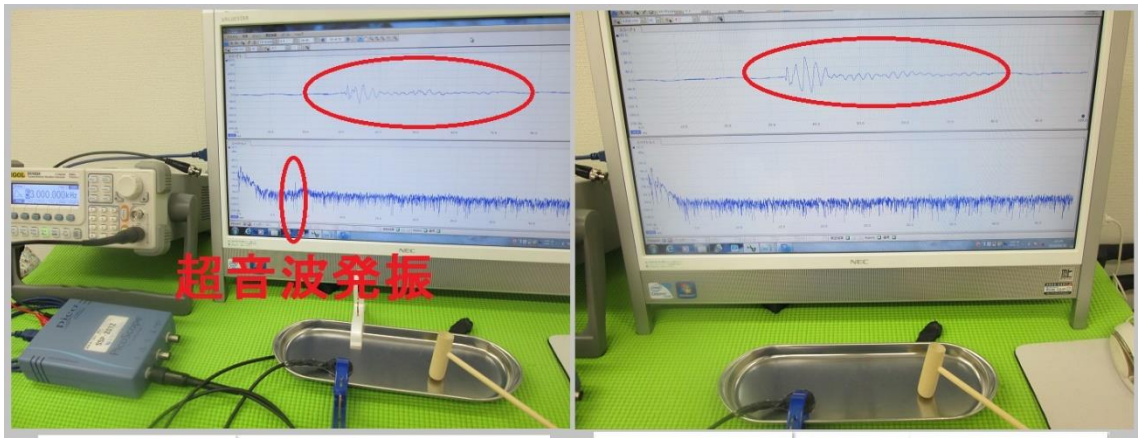


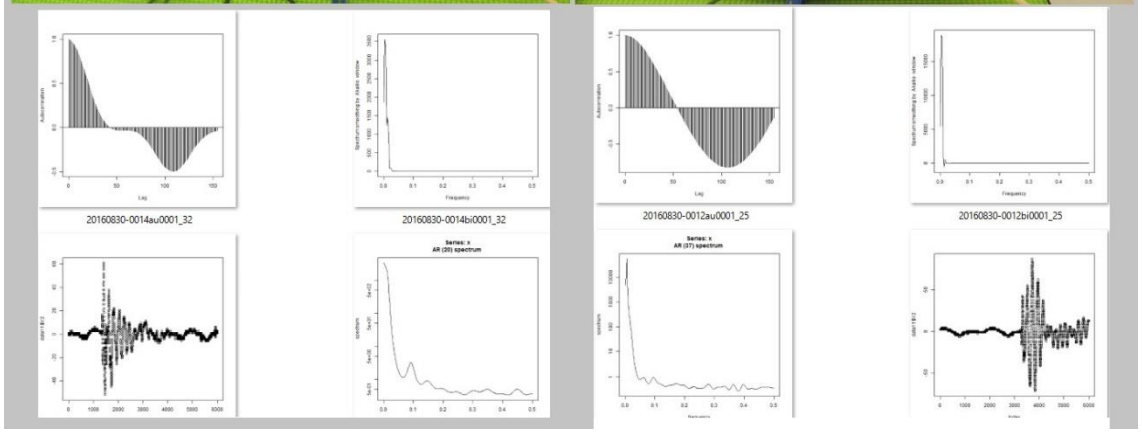


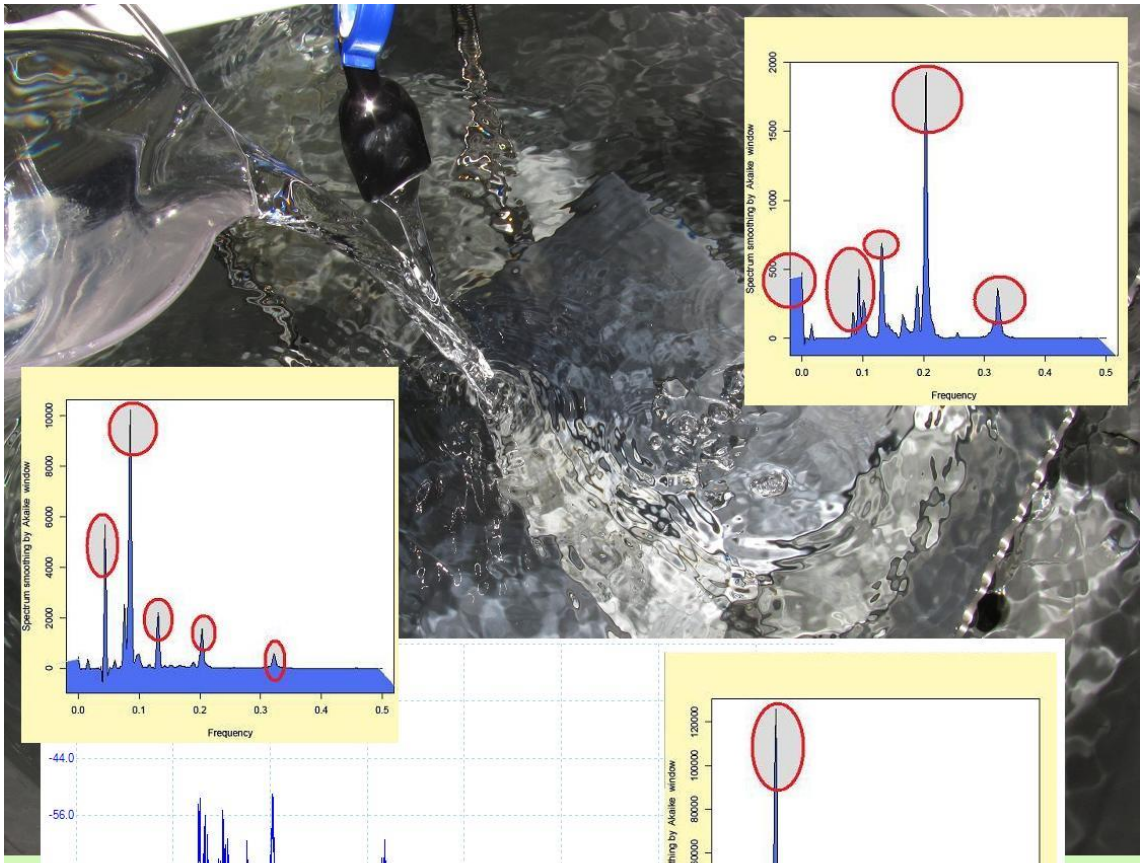


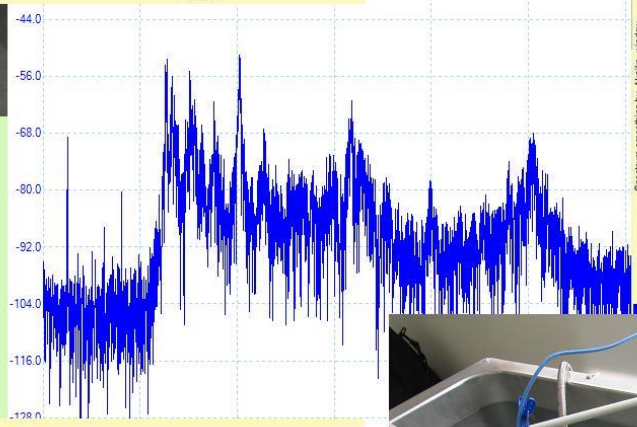

超音波発振
（出力0．5V）

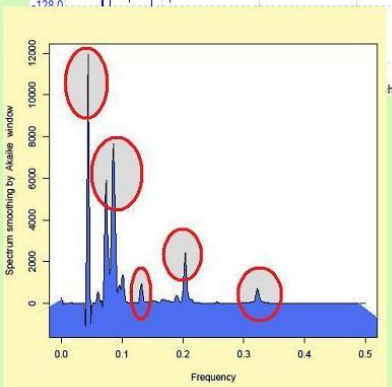

20160830-0010au0001_18
20160830-0010bi0001_18
20160830-0012au0001_25
20160830-0012bi0001_25

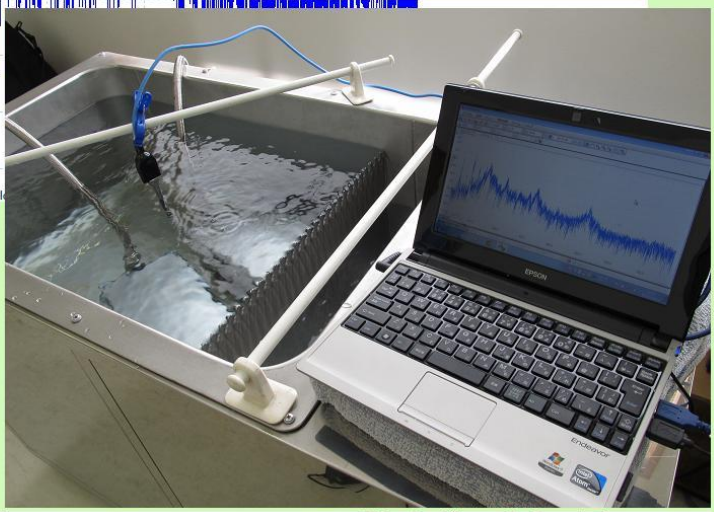

超音波発振


20160830-0014au0001_32
20160830-0014bi0001_32
20160830-0012au0001_25
20160830-0012bi0001_25

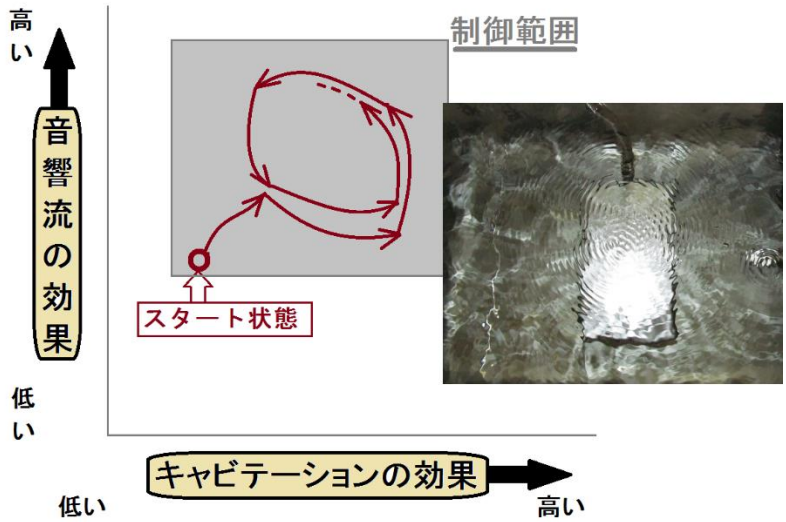




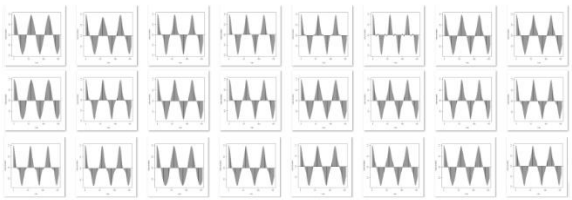




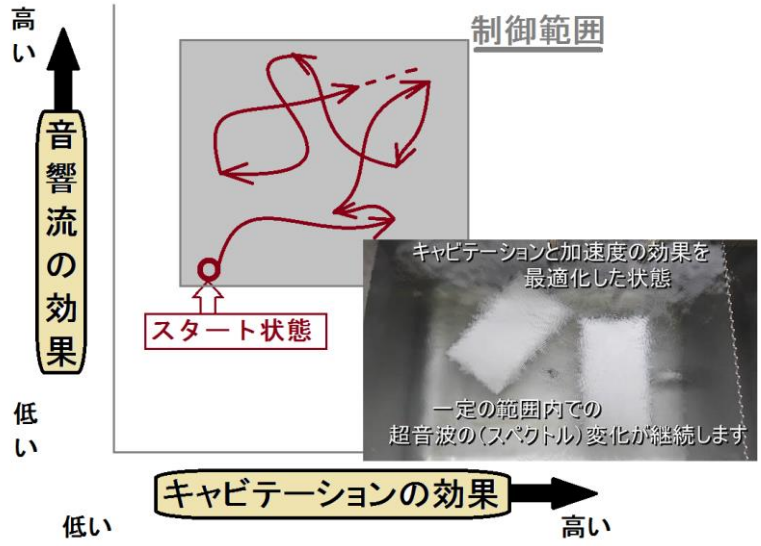
＜超音波のダイナミック制御技術＞



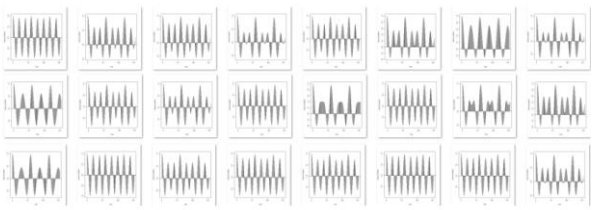
単調な超音波刺激に関する「**論理**モデル」



音圧データの解析結果：自己相関



超音波の流れに関する「**非線形**制御モデル」



音圧データの解析結果：自己相関

TIMSAC for R package

統計数理研究所　November 1, 2006

TIMSAC(TIMe Series Analysis and Control program package) は，統計数理研究所で開発された時系列データの解析，予測，制御のための総合的プログラムパッケージです．・・・
TIMSAC はFORTRANで書かれたプログラムですが，ユーザーが作成したFORTRAN，C，Java のプログラムにこのライブラリをリンクすることにより，より扱い易い環境が実現されました．

バイスペクトルの解析関数

bispec()：バイスペクトルの計算

自己相関の解析関数

autcor()：直接法による自己共分散関数の計算

3）TIMSAC for R package

http://jasp.ism.ac.jp/ism/timsac/

その他

統計的な考え方を利用した超音波

http://ultrasonic-labo.com/?p=12202

超音波プローブの発振制御による振動評価技術

http://ultrasonic-labo.com/?p=15285

超音波制御技術（特許出願済み）

http://ultrasonic-labo.com/?p=16309

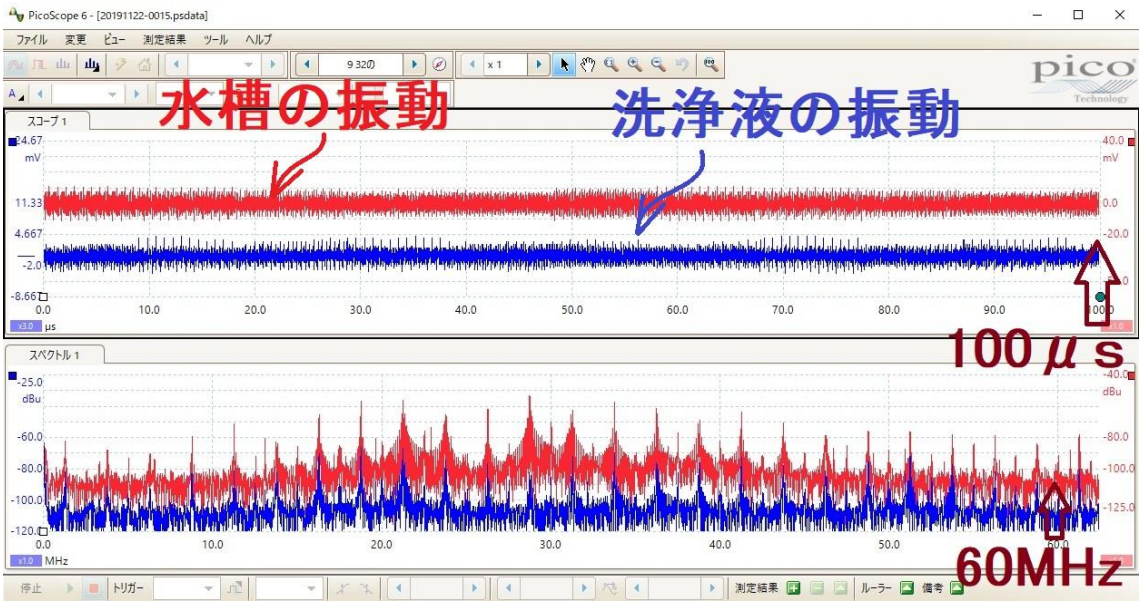
メガヘルツの超音波発振制御プローブ

http://ultrasonic-labo.com/?p=14570

メガヘルツの超音波を利用する超音波システム技術

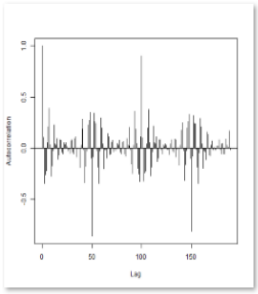
http://ultrasonic-labo.com/?p=14350

参考データ

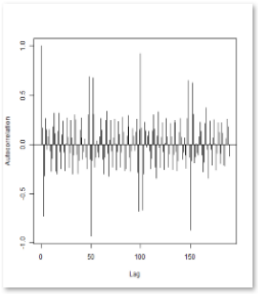


解析結果

自己相関（最大　200Lag）


20191122-0016au0001_09

音圧データ1：青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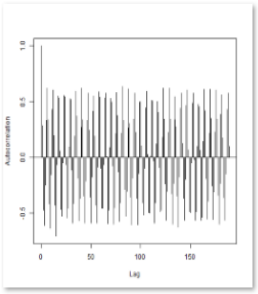
音圧データ1：赤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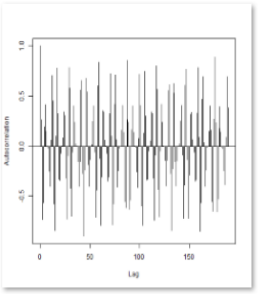
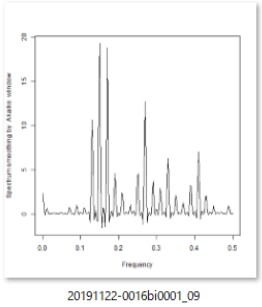
音圧データ2：青


20191122-0016au0001_10B

音圧データ2：赤

バイスペクトル（最大周波数　62MHz）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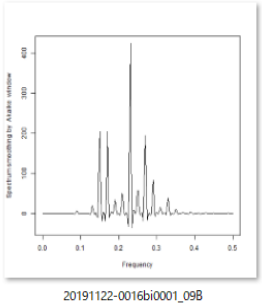
音圧データ1：青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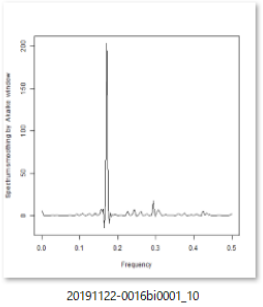
音圧データ1：赤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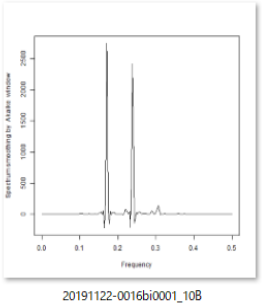
音圧データ2：青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音圧データ2：赤

100μ秒でこのような音圧変化を実現することが、新しい超音波制御技術です

その他
インパルス応答
mulmar

Multivariate Case of Minimum AIC Method of AR Model Fitting

Description

Fit a multivariate autoregressive model by the minimum AIC procedure. Only the possibilities of zero coefficients at the beginning and end of the model are considered. The least squares estimates of the parameters are obtained by the householder transformation.

Usage

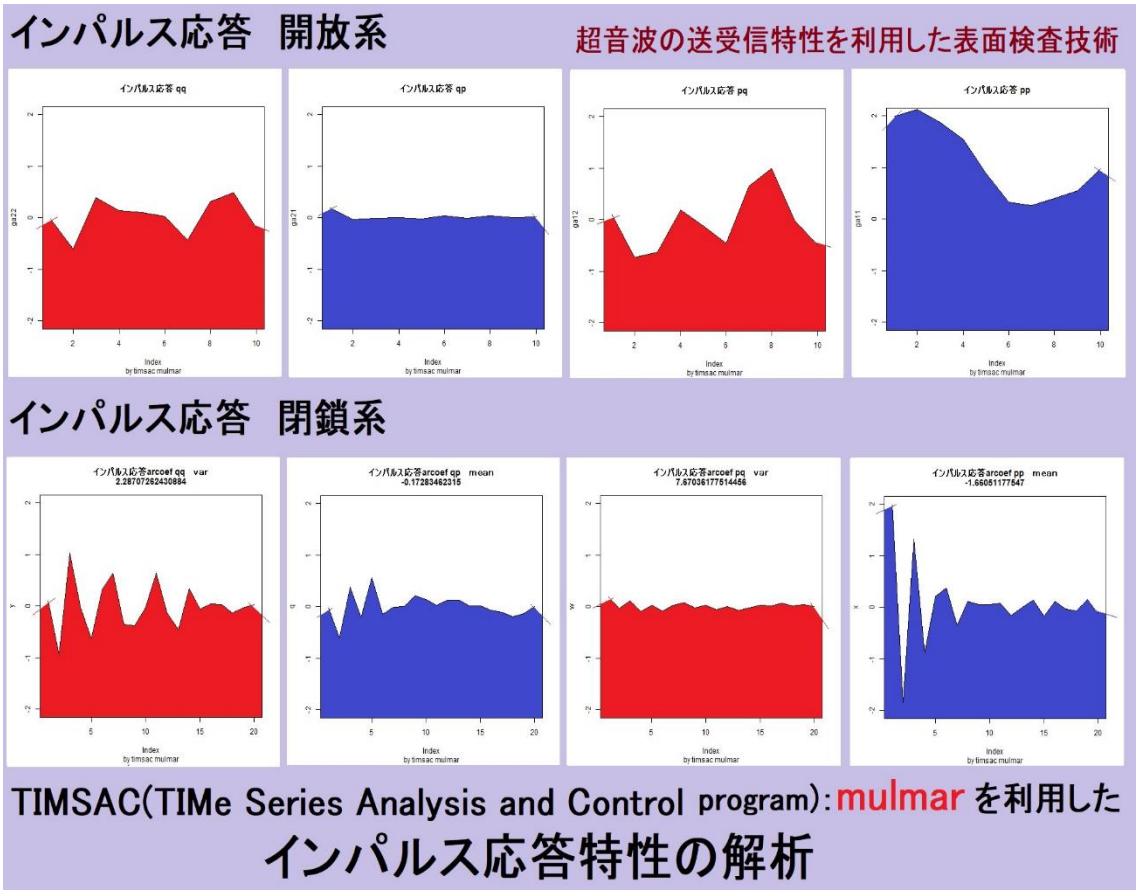
mulmar(y, max.order = NULL, plot = FALSE)

Arguments

y a multivariate time series.

max.order upper limit of the order of AR model, less than or equal to n=2d where n is the length and d is the dimension of the time series y.

plot logical. If TRUE, daic[[1]]; : : : ;daic[[d]] are plotted.



パワー寄与率

mulnos

Relative Power Contribution

Description

Compute relative power contributions in differential and integrated form, assuming the orthogonality between noise sources.

Usage

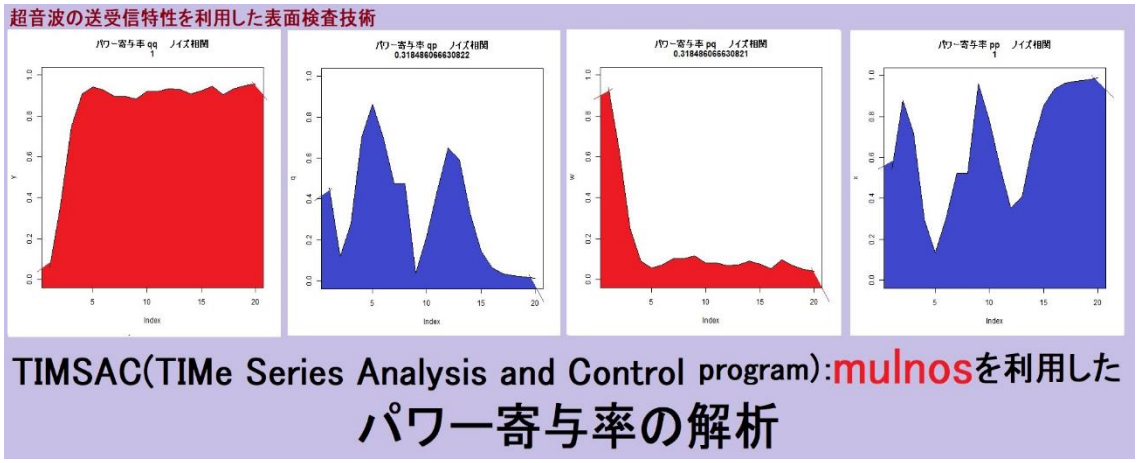
mulnos(y, max.order = NULL, control = NULL, manip = NULL, h)

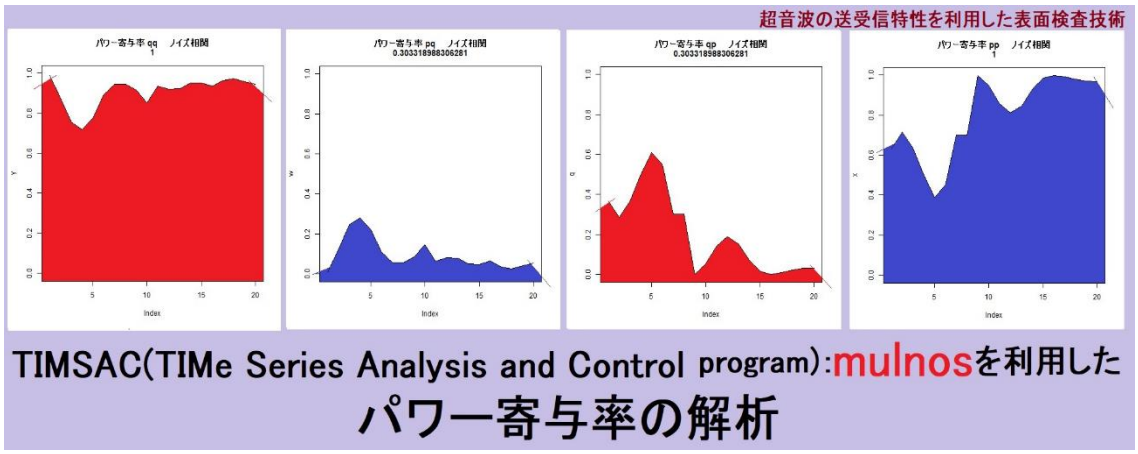
Arguments

y a multivariate time series.
max.order upper limit of model order. Default is 2p
n, where n is the length of time series y.
control controlled variables. Default is c(1 : d), where d is the dimension of the time series y.
manip manipulated variables. Default number of manipulated variable is ’0’.
h specify frequencies i=2h (i = 0; : : : ;h).

Value

nperr a normalized prediction error covariance matrix.
diffr differential relative power contribution.
integr integrated relative power contribution





以上