FDB Fan Presentation

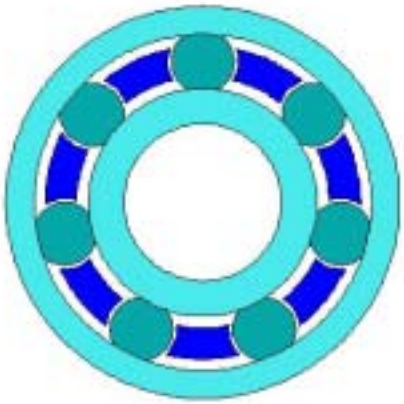
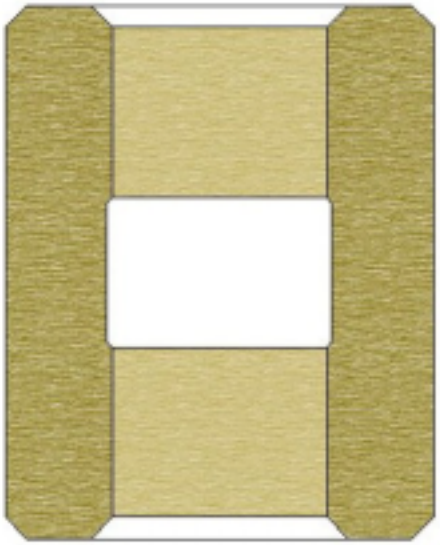
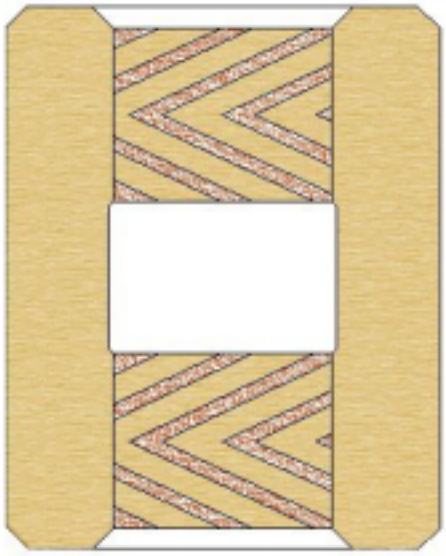
Aug , 2005

- ***Bearings Introduction.***
  - Bearing's Comparison.
  - FDB Principle.
- ***FDB Fan Property.***
  - Noise.
  - Anti-Shock.
  - Non-Contact of Shaft.
- ***Development of FDB Fan.***
  - EVT Case Study.
- ***Conclusion***

Bearings Introduction

Bearing Introduction

- **Bearing Introduction**

Ball Bearing	Sleeve	FDB
		
Point contact	Line(point) contact	Non-contact

Bearing Introduction

- Chart for individual types of Bearings:

	High Speed	Low Noise	Low Vibration	Anti Shock	Longevity	Flexibility	Cost	Accuracy
FDB	○	○	○	○	○	○	△	○
Ball Bearing	○	△	△	X	○	△	△	○
Sleeve Bearing	△	○	○	○	X	○	○	△

Note : ○ ---- Good

△ ---- Normal

X ---- Poor

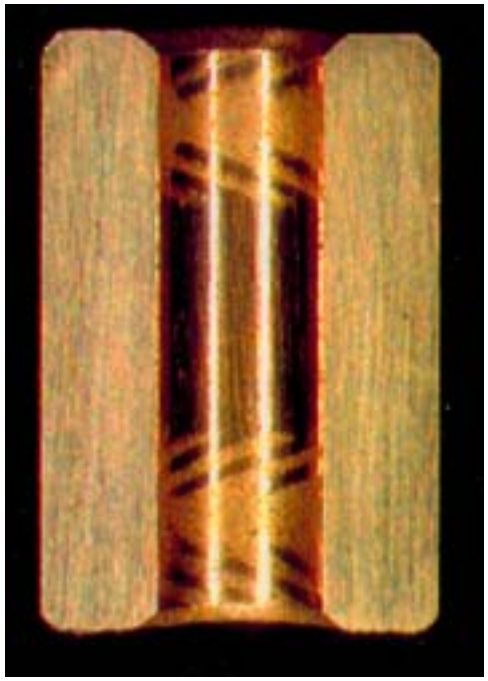
FDB Principle

Fluid Dynamic Bearing.

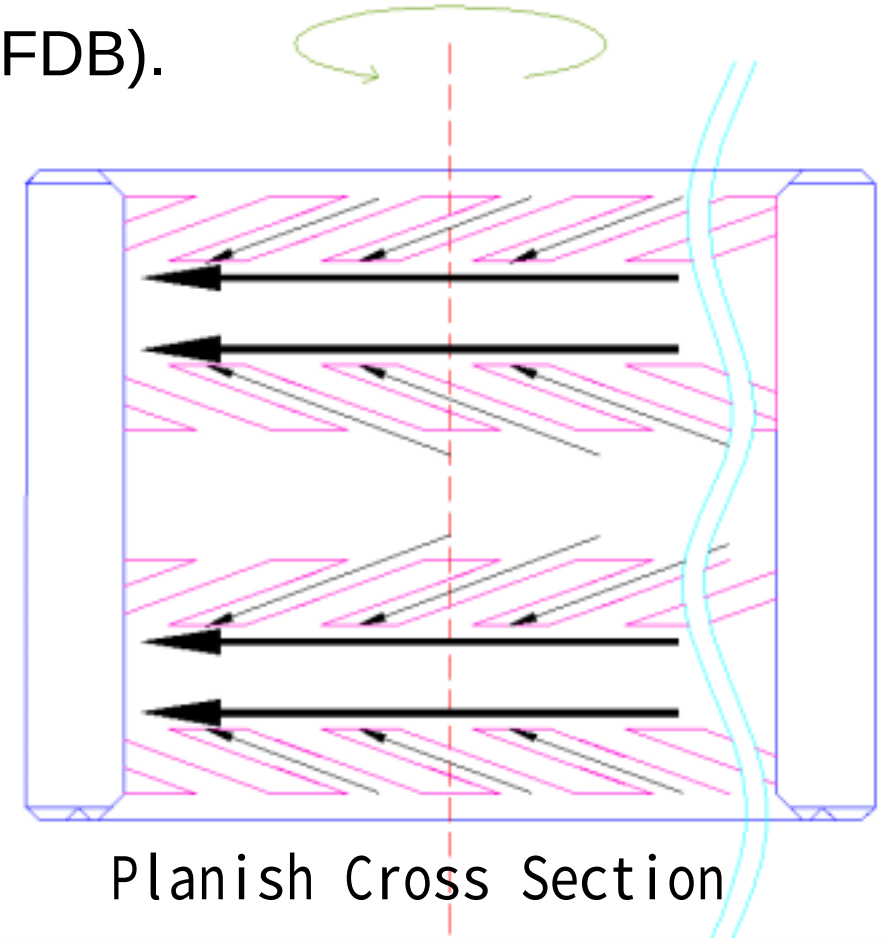
→ Oil gather together into two rings.

→ Provides high pressure oil rings.

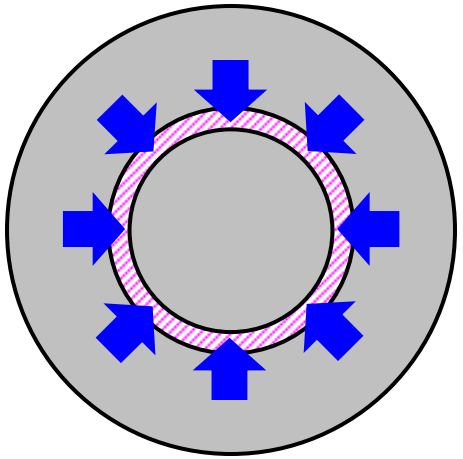
→ Oil rings contains shaft floating in center (non-contact with FDB).



Cross Section

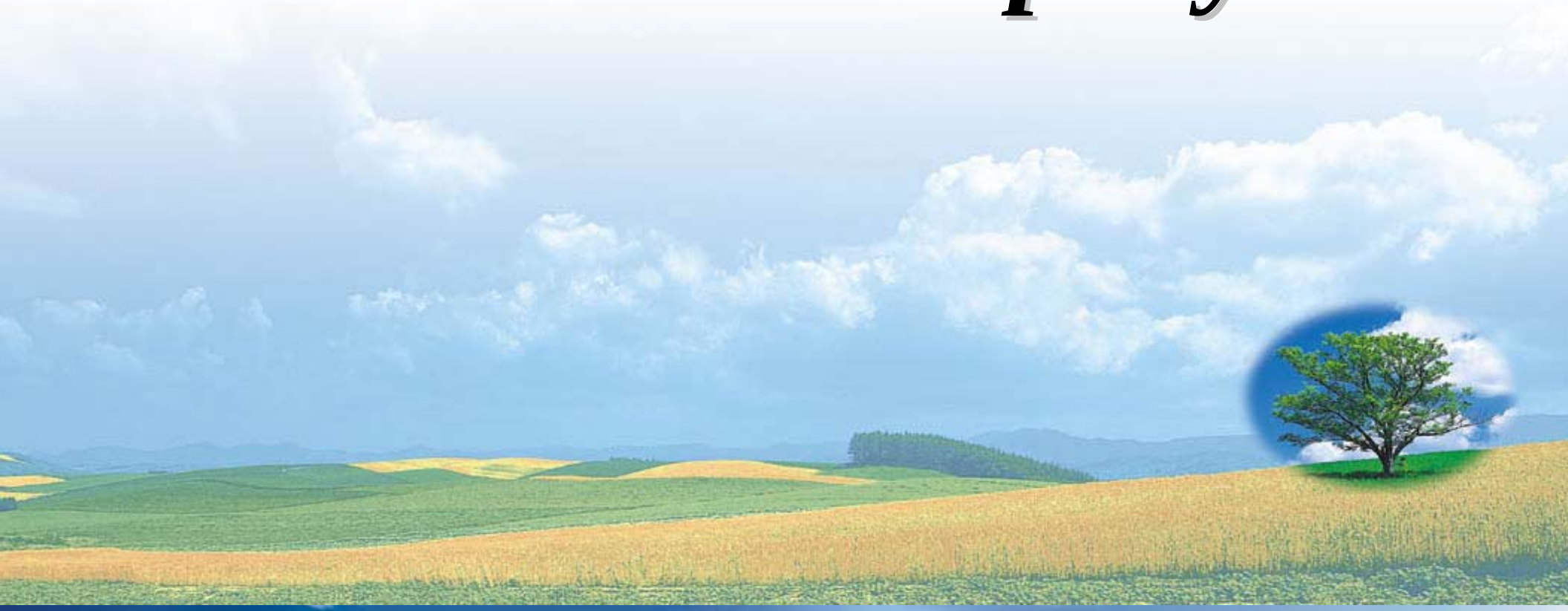


Planish Cross Section



Top View

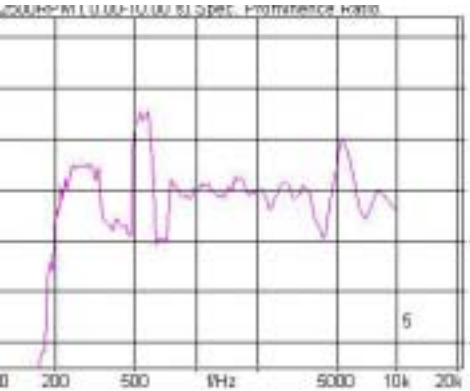
FDB Fan Property



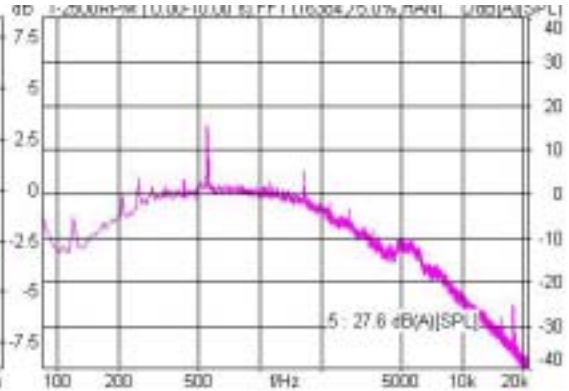
Noise and Anti-Shock

- **NOISE PERFORMANCE COMPARISON: @2500rpm, 0.5M Horizontal.**

FDB: 27.6dB(A)

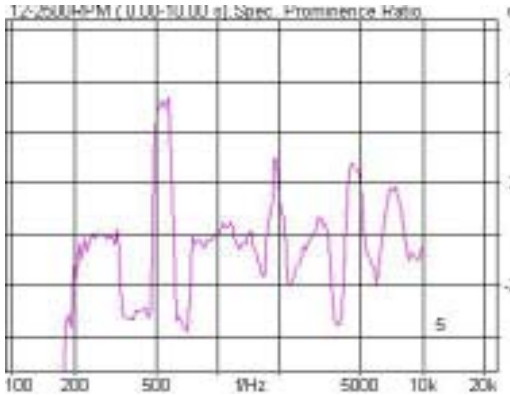


(PROMINENCE RATIO)

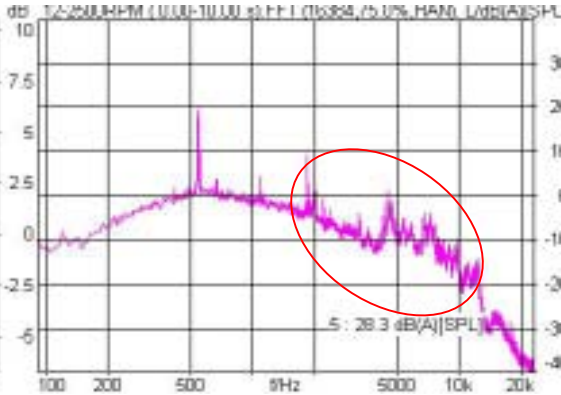


(SOUND PRESSURE LEVEL)

2 BALL: 28.3dB(A)



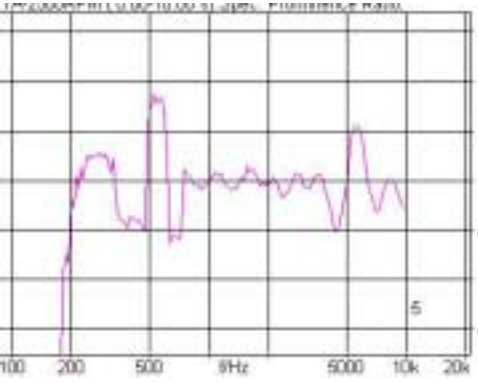
(PROMINENCE RATIO)



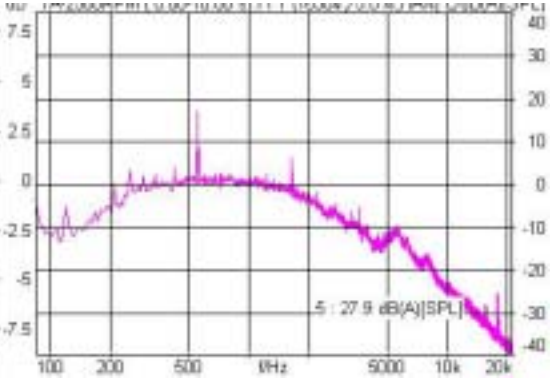
(SOUND PRESSURE LEVEL)

- **ANTI-SHOCK CAPABILITY COMPARISON: @2500rpm, 0.5M Horizontal.**
  - **Drop Non-Operating Blower from 60cm onto 1cm thick plywood.**

FDB: 27.9dB(A), 1% UP

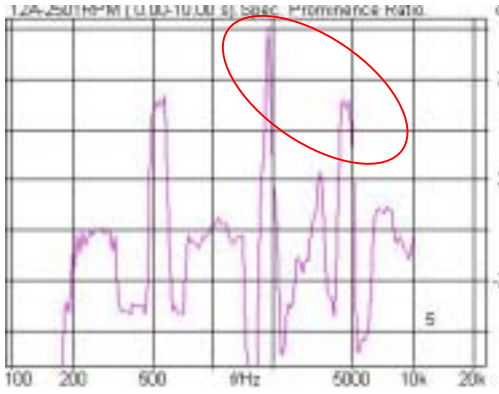


(PROMINENCE RATIO)

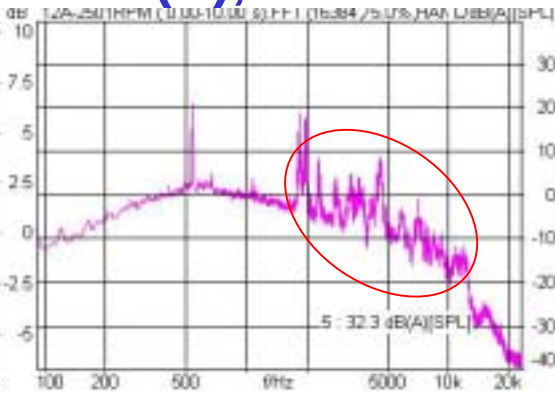


(SOUND PRESSURE LEVEL)

2 BALL: 32.3dB(A), 14% UP



(PROMINENCE RATIO)



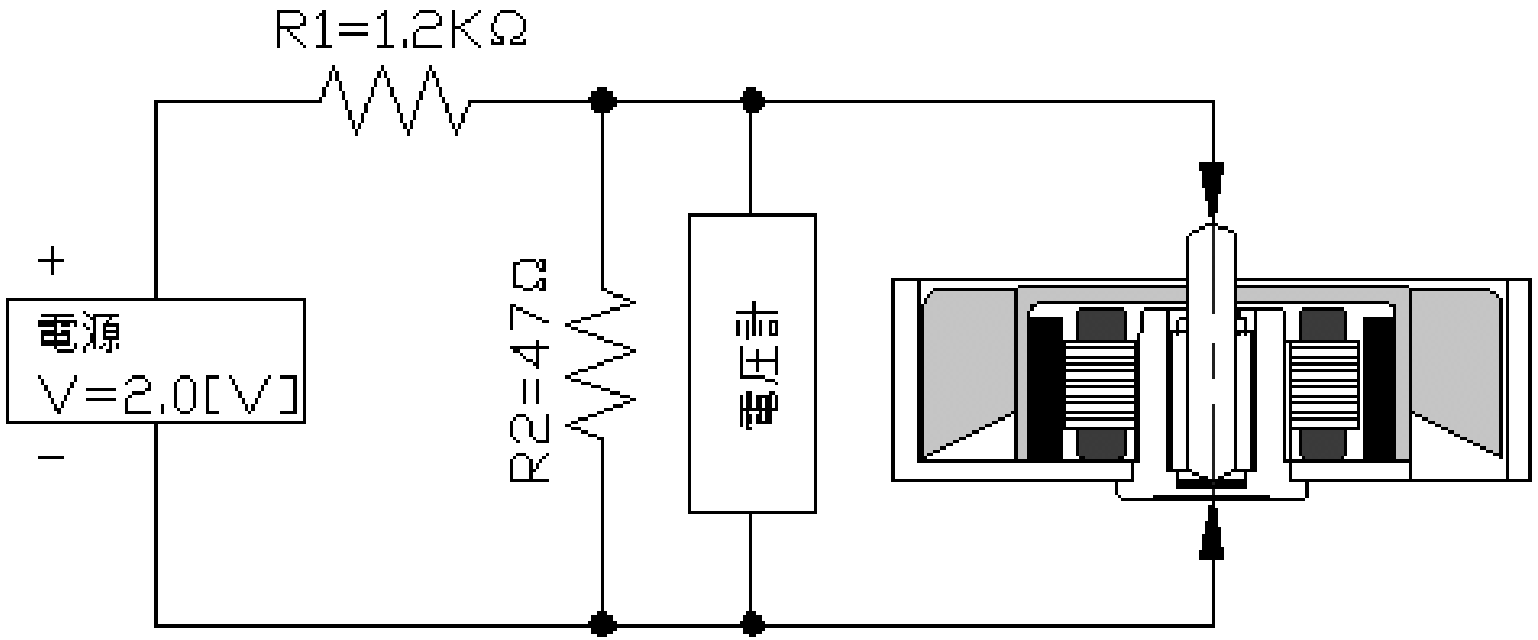
(SOUND PRESSURE LEVEL)

Prepared by: Tony Chuang

Non-Contact of Shaft

Confirmation of Fluid Dynamic Effect :

Test Equipment of Oil-Film Formation



Test Circuitry Diagram

R_{fan} ∞ → $V_{fan}=V_{Total}*(R2/(R1+R2))=2*(47/1247)=0.075(V)=75mV$ → 100%

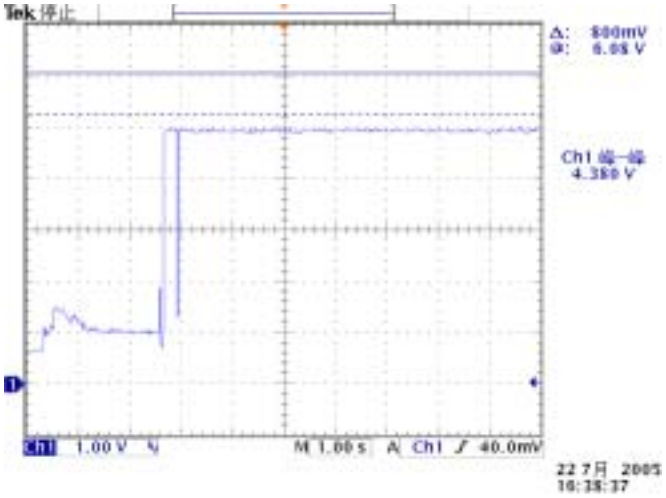
R_{fan} 0 → $V_{fan}=V_{Total}*(R_{fan}/(R1+R2))=0*(47/1247)=0(V)=0(mV)$ → 0%

Non-Contact of Shaft

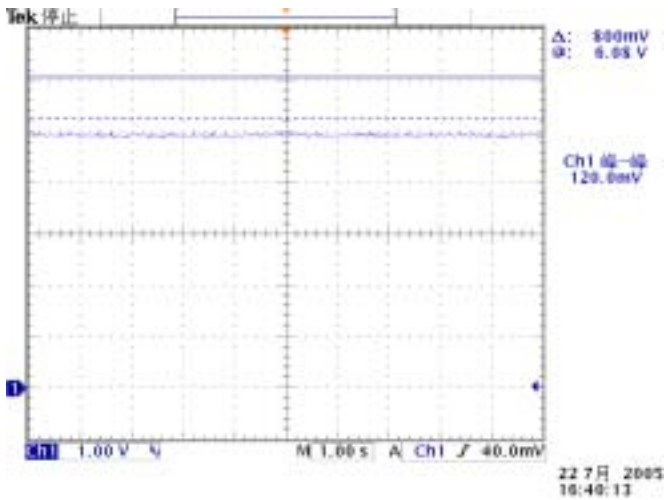
- Oil-Film Formation

FDB

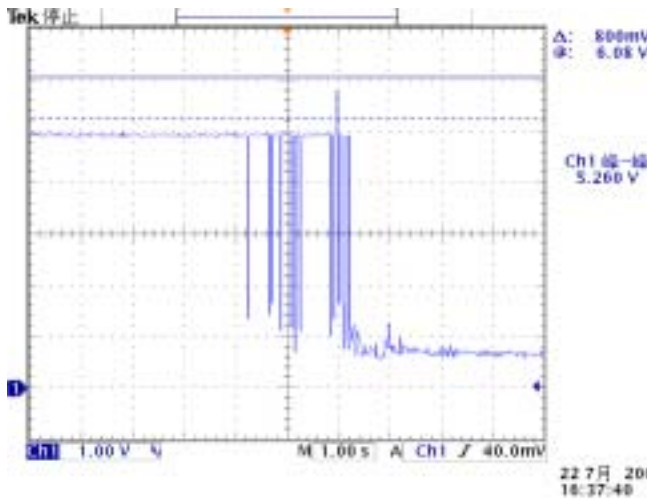
Starting



Running

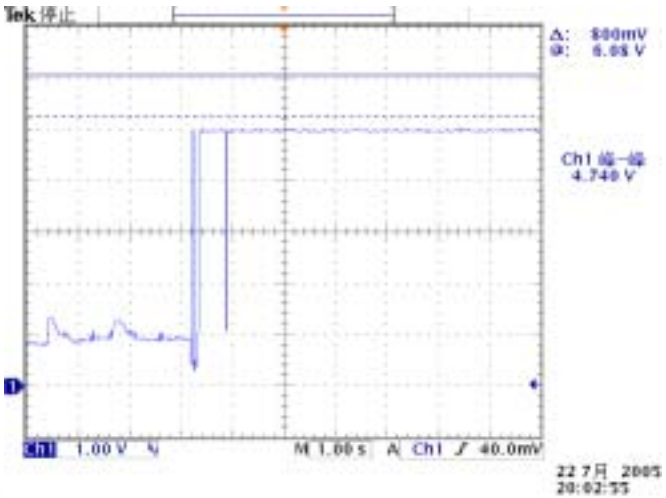


Stop

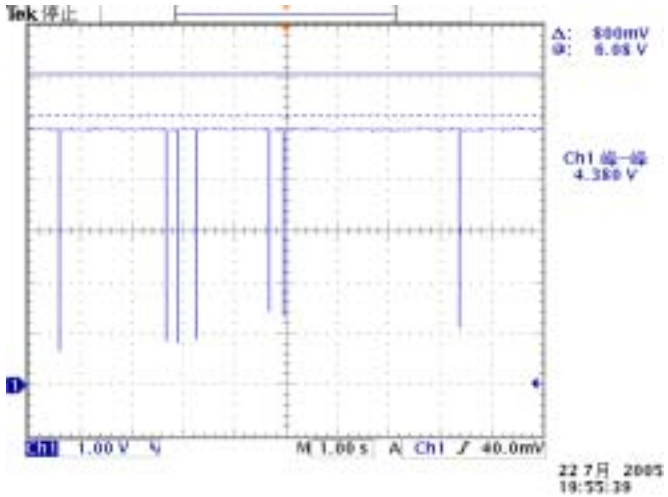


Sleeve

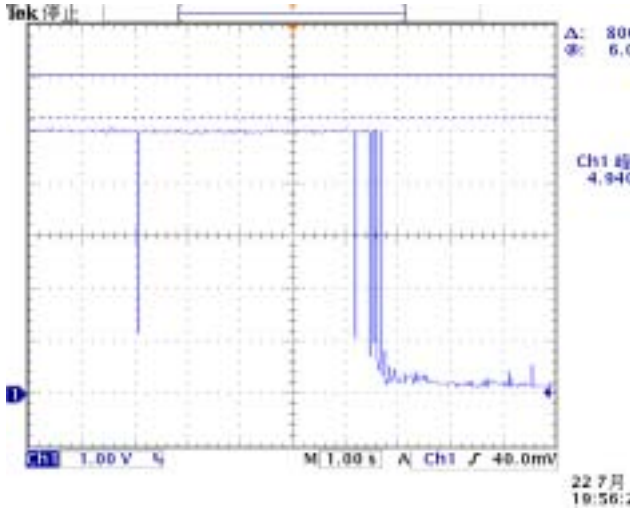
Starting



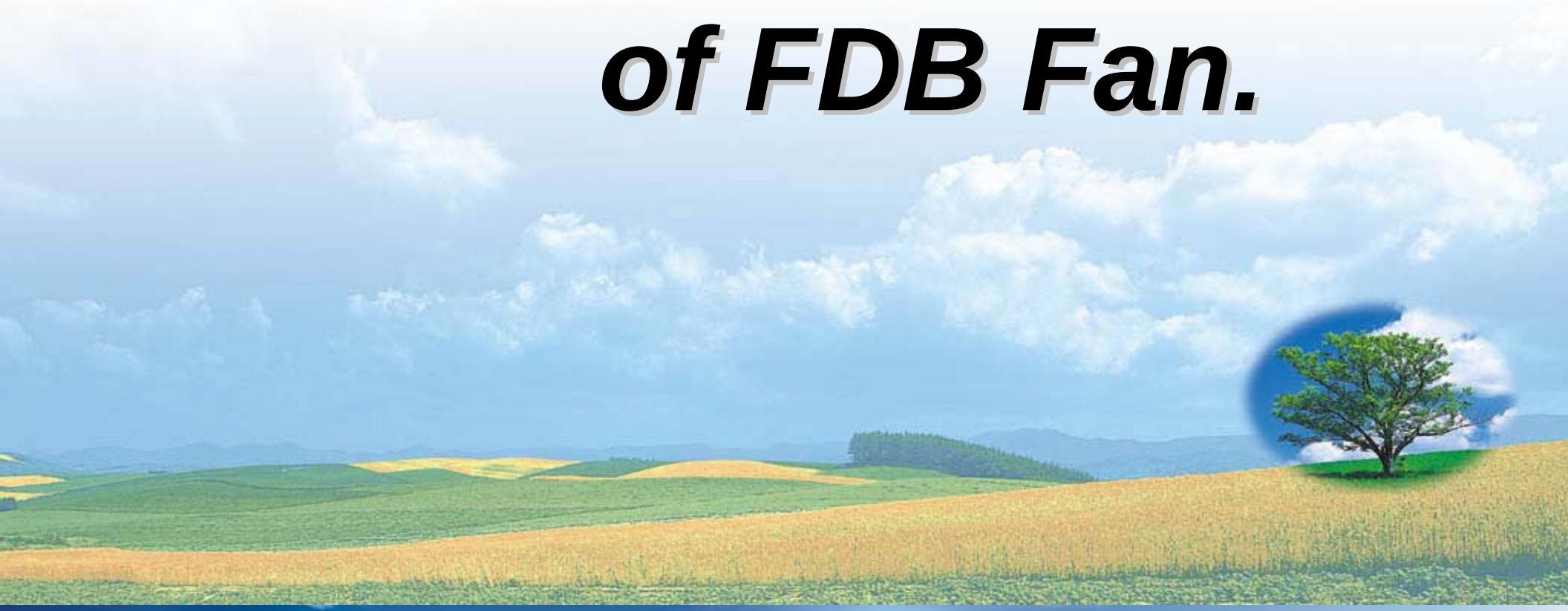
Running



Stop



Development of FDB Fan.



EVT Property Study(Case 1)

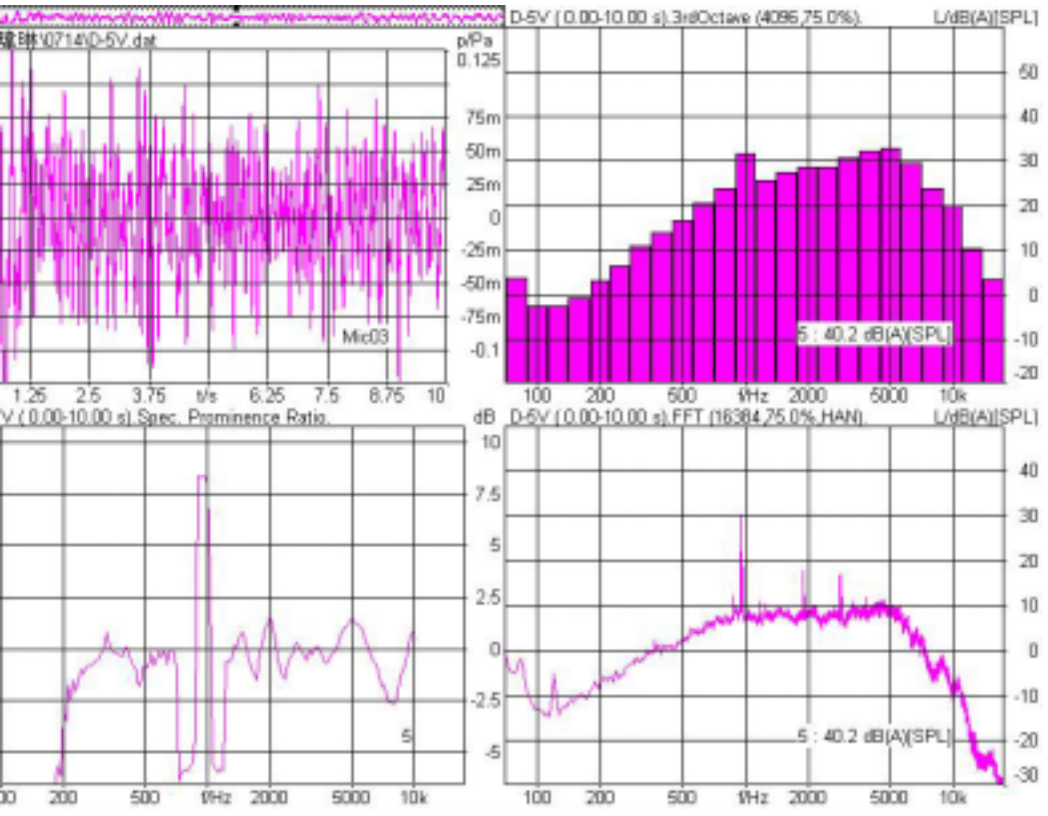
---Compare with P-FAN

---Evaluate Different FDB

Fan Property in Module

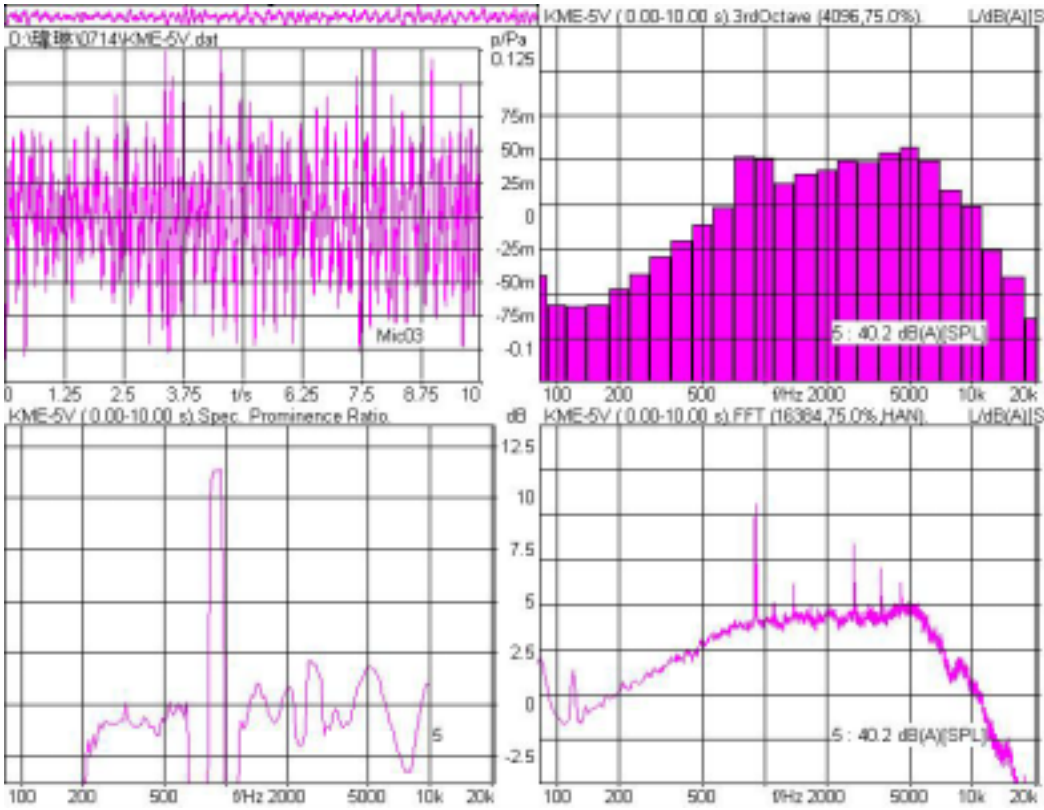
ITEM	DELTA	P-FAN
Rated Voltage(Vdc)	5.0	5.0
Starting Voltage(Vdc)	0.16	0.17
Input Current(A)	0.18	0.22
Input Power(W)	0.90W	1.10W
Rotation Speed	4300	4080
Max. Air Flow(mmH2O) (At Zero Static Pressure)	4.399	4.176
MAX. Air Pressure(CFM) (At Zero Air Flow)	10.550	10.129
Acoustical Noise (dBA@50cm)	40.2	40.2
Unbalance (Meet G6.3)	0.80 mg	--
Fan Type	Dish Fan	Dish Fan
Rotation Direction	C.C.W	C.C.W

Noise Comparison in Module

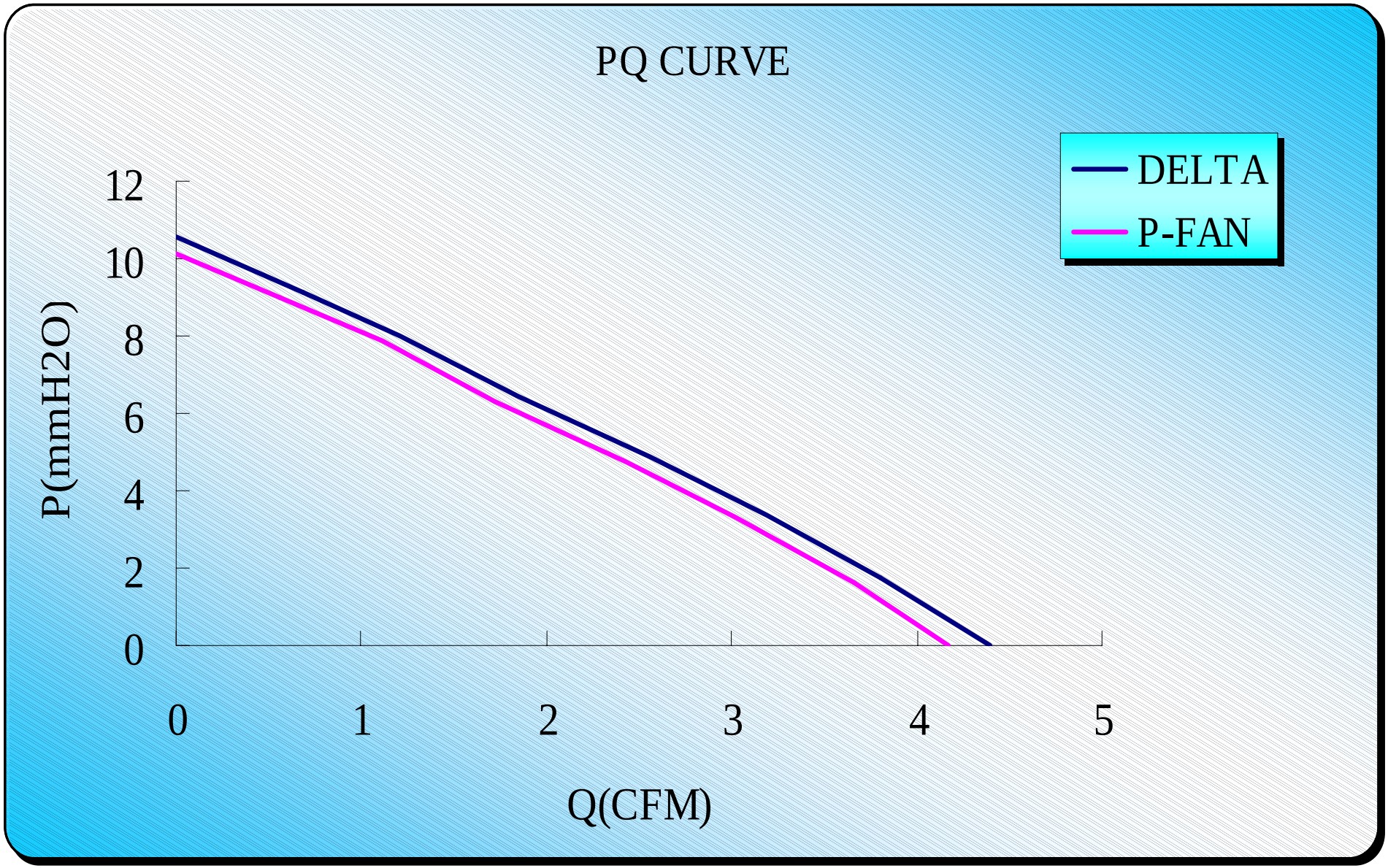


DELTA FAN

P-FAN



PQ CURVE Comparison in Module

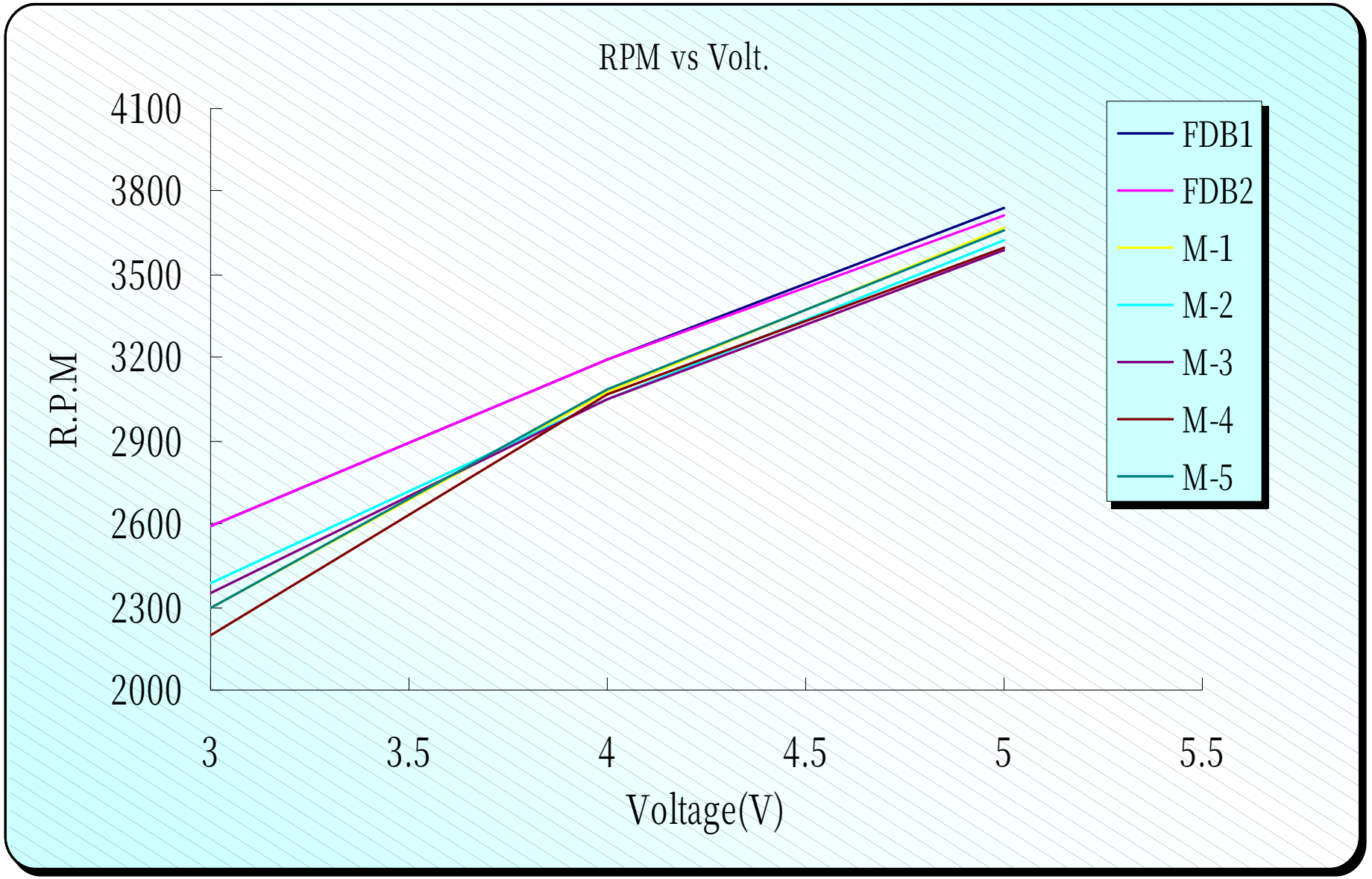


EVT Property Study(Case 2)

---Compare with Delta's Tooling Fan

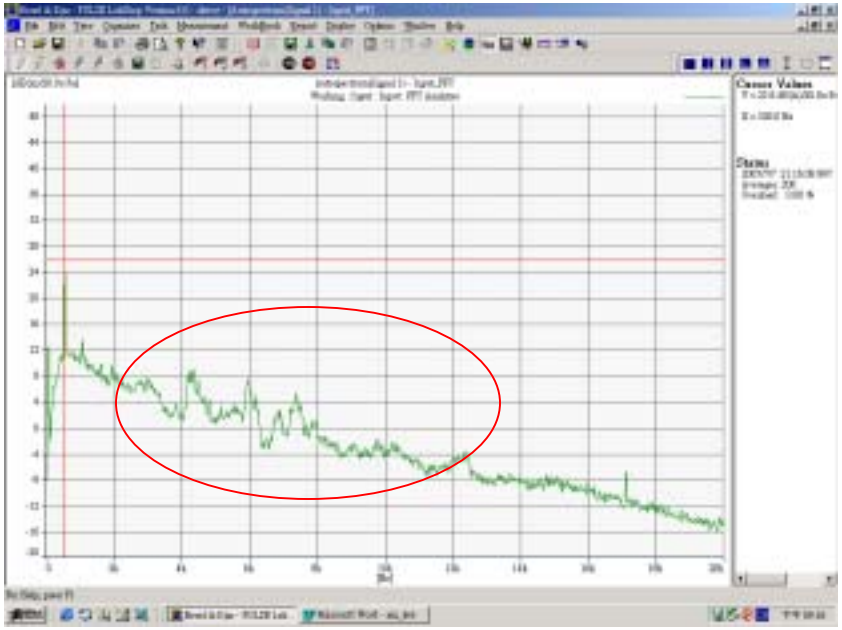
---Evaluate Ball Bearing & FDB

RPM Comparison

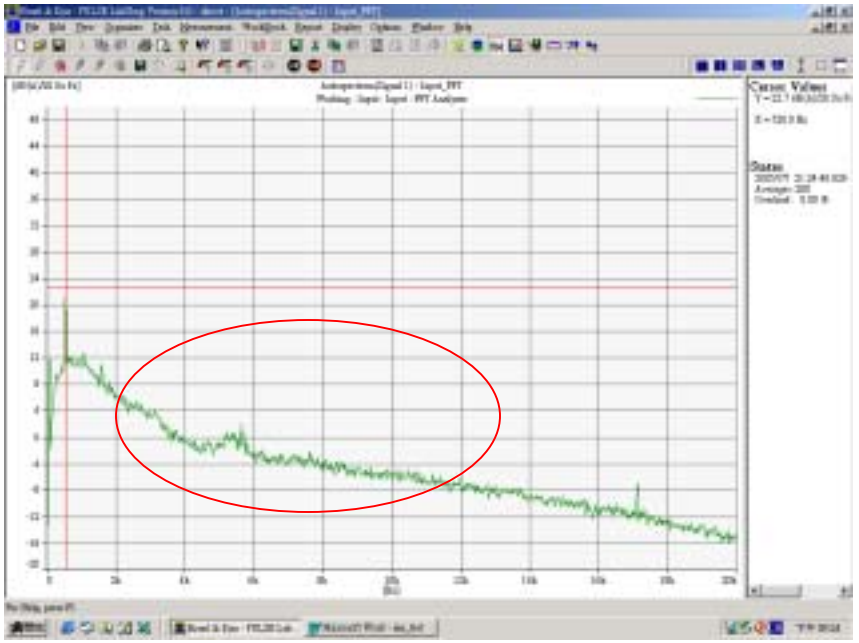


Noise Comparison (at 18cm Distance)

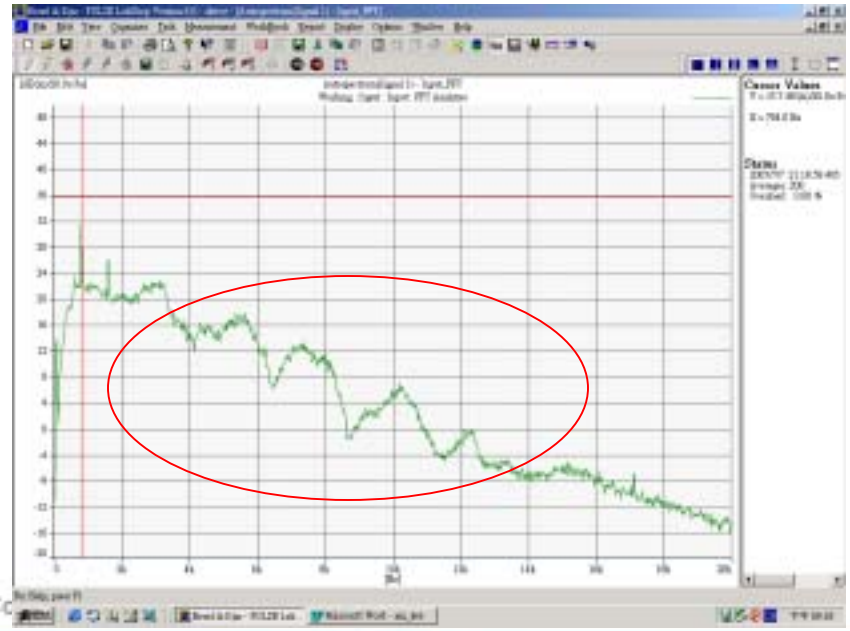
- **Ball bearing @ 3V**



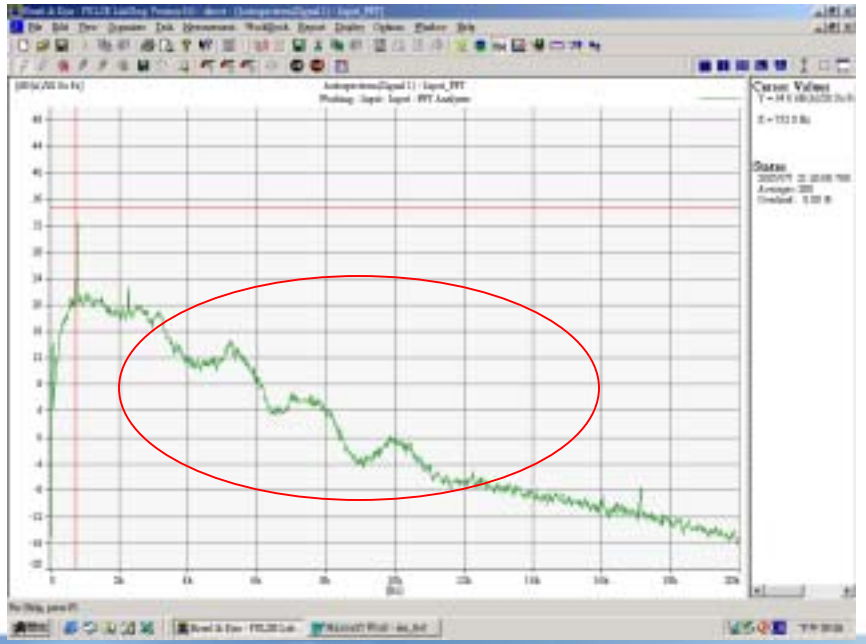
- **FDB bearing @ 3V**



- **Ball bearing @ 5V**



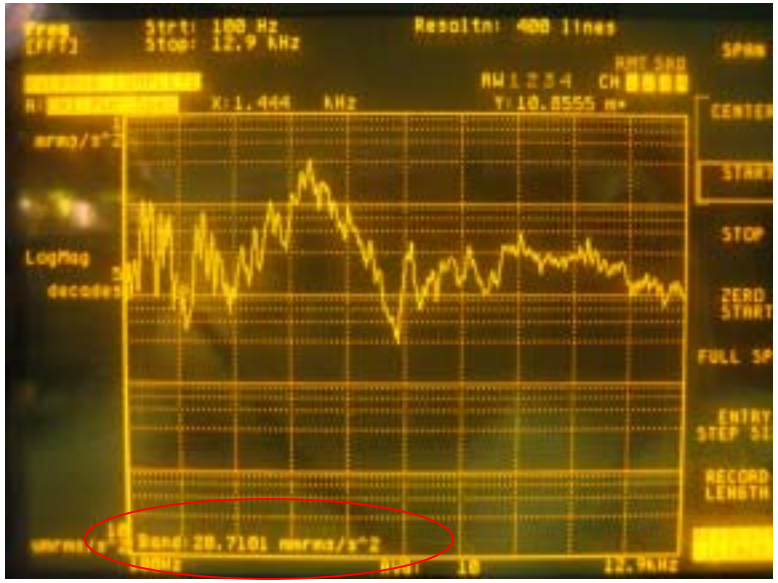
- **FDB bearing @ 5V**



Shock Comparison (Radial)

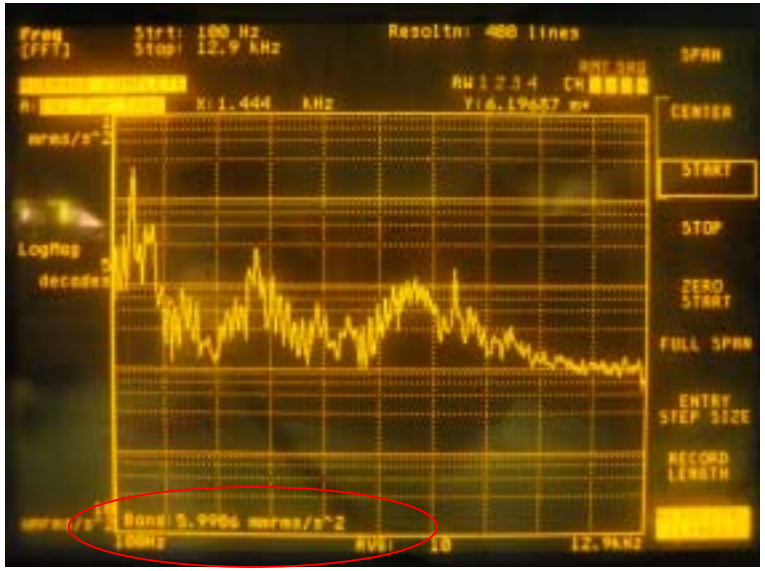
➢ Ball bearing @ 3V

Value:20.71 mm/s^2



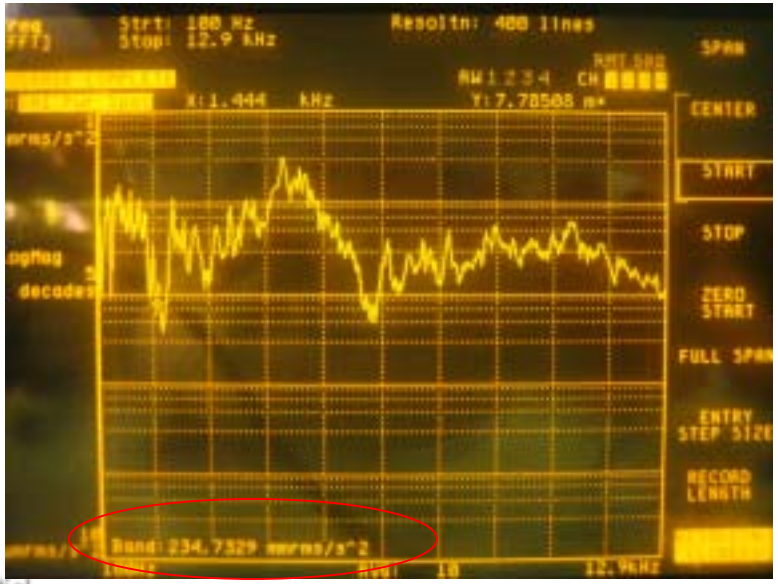
➢ FDB bearing @ 3V

Value:5.99 mm/s^2



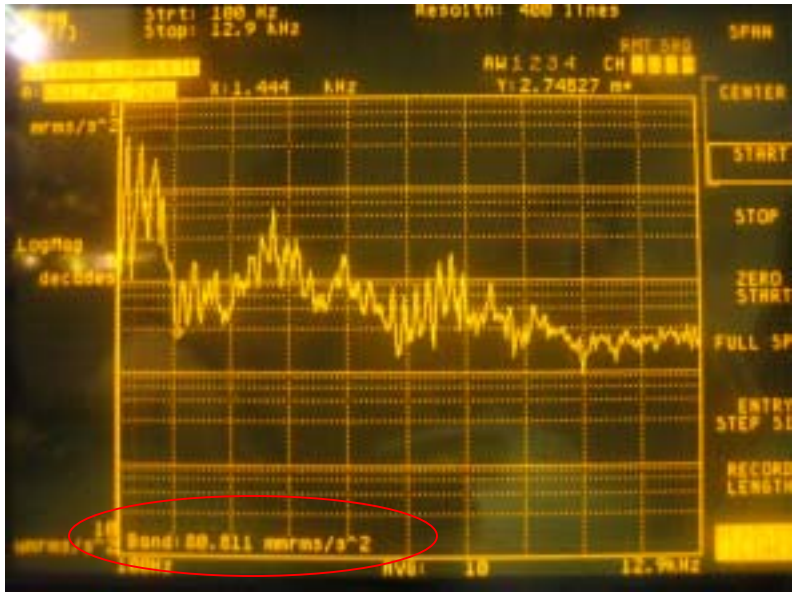
➢ Ball bearing @ 5V

Value:234.73 mm/s^2



➢ FDB bearing @ 5V

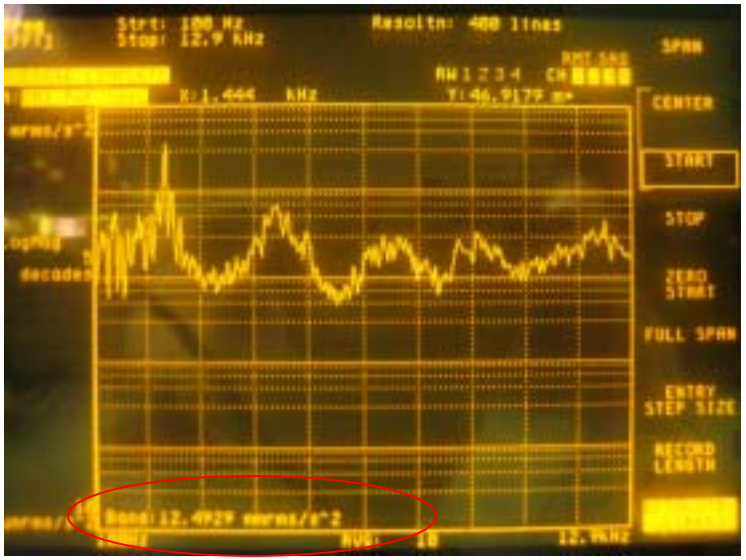
Value:80.81 mm/s^2



Shock Comparison (Axial)

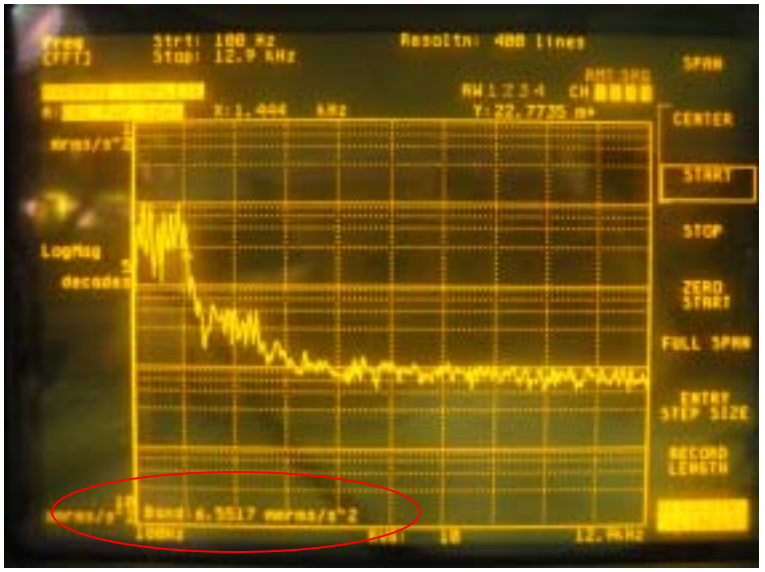
➢ Ball bearing @ 3V

Value:12.49 mm/s^2



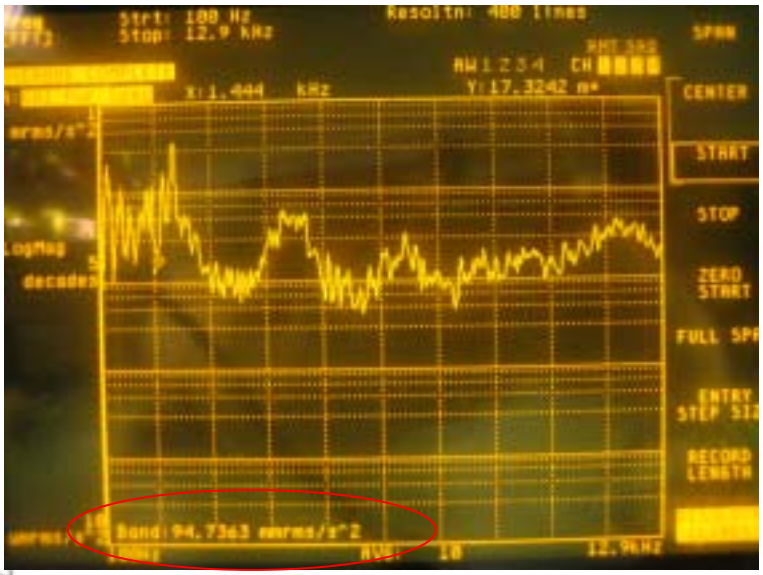
➢ FDB bearing @ 3V

Value:6.55 mm/s^2



➢ Ball bearing @ 5V

Value:94.73 mm/s^2



➢ FDB bearing @ 5V

Value:94.50 mm/s^2

Conclusion

Function of FDB

- Good Noise Performance at Both Low and High Speed Condition.
- Excellent Anti-Shock Capability.
- Lower Radial Vibration Compare with Ball Bearing.
- Less Friction Can Save More Power.

Delta is your value partner in your business success