Requirements on Frequencies of RDDS1

	Random	Systematic
Accelerating Mode	$\sigma = 3\,\mathrm{MHz}$	$\left\lvert \int \delta\phi \right\rvert < 5^\circ$
Lowest dipole mode	$\sigma = 3\,\mathrm{MHz}$	a few MHz ?

How to realize F_{ACC} and F_{d1}

1. Random error (ACC & HOM)

   NC cut based on Controlled QD

   leads to δ2a, δ2b equivalent to OD.

2. Accelerating mode frequency in average

   3-6-disk stack RF-QC.

   Evaluate $F_{2\pi/3}$ mode frequency.

   Calculate integrated phase slip.

   Feed forward to 2b of following disks.

3. Systematic error in F_{d1}

   Smoothly varying dimensions and well-established disk dimensions at some points do the job with item 1.

2D-disk study was done

to confirm the machining strategy

CMM contour measurement

Proved to be within ±1 μm

Absolute frequency evaluation

for TM010-0, 2π/3, π and TM110-0,π

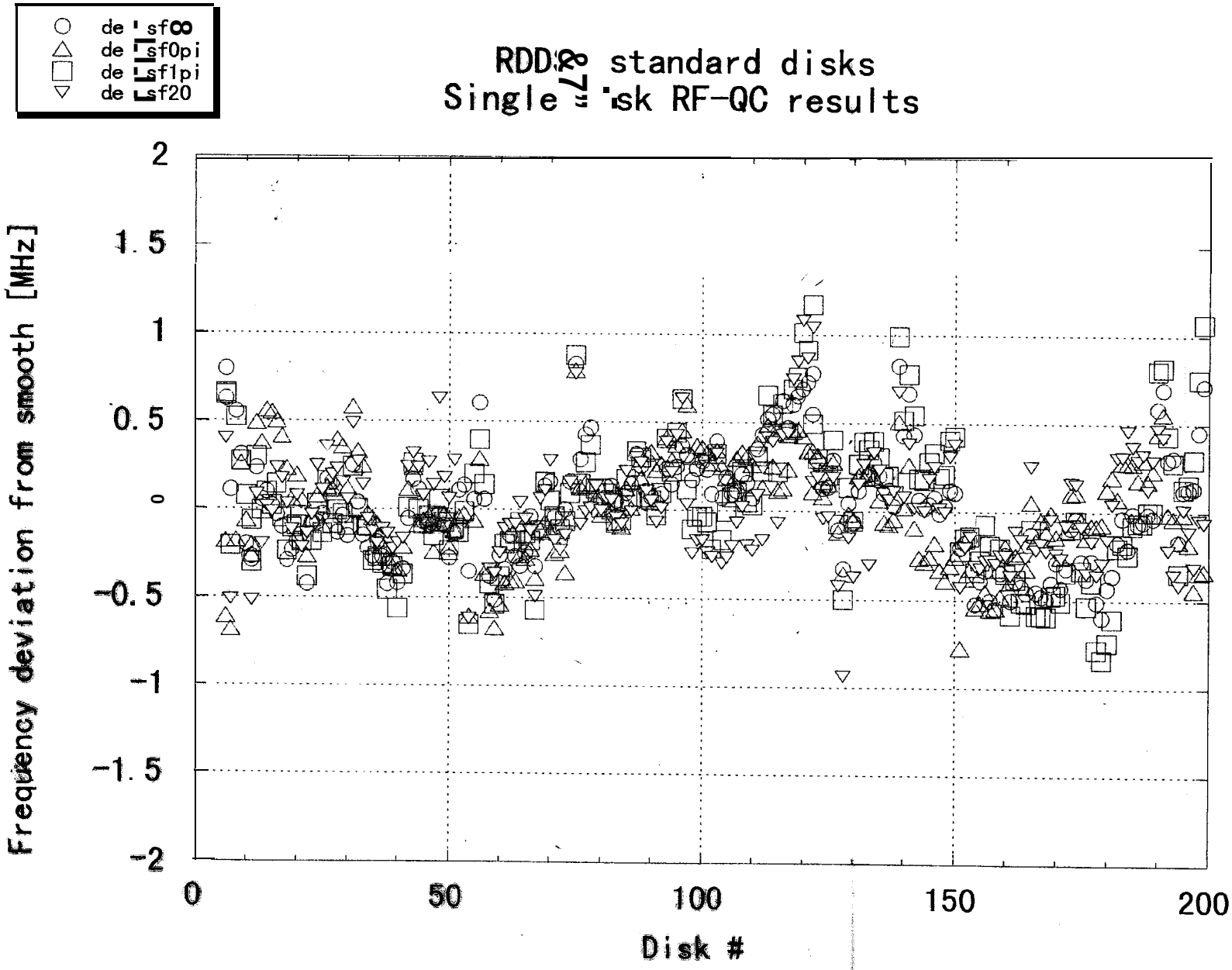
Calculation	convergence < 0.1MHz
Measurement	error < 0.2 -- <0.5 MHz
Agreement	better than 0.5MHz

We concluded that we could produce disks based on the present strategy with, a precision at worst, but in an absolute sense,

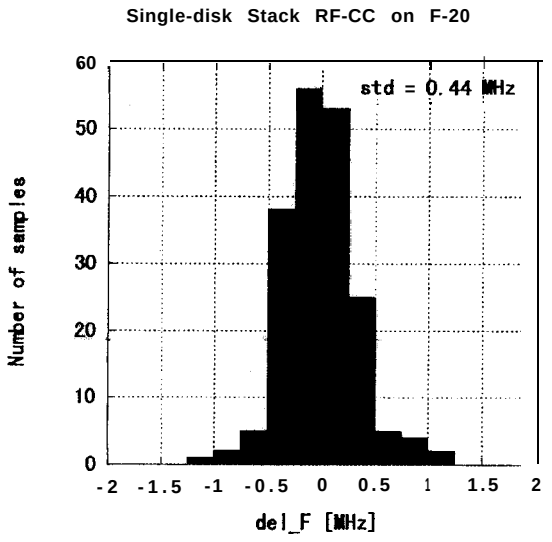
Contour of ±1 μm

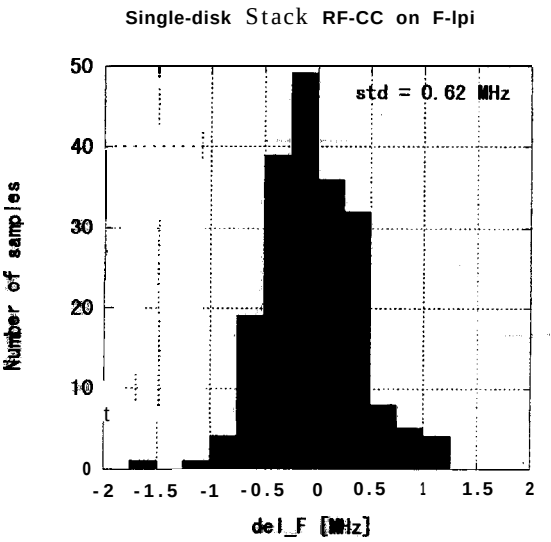
Frequency of ±1 MHz.

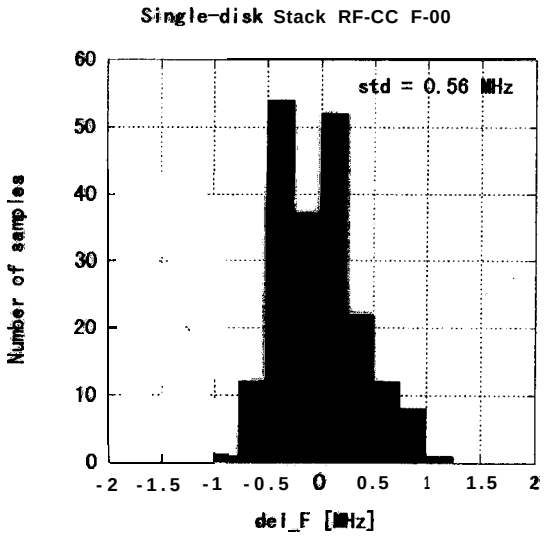
99Nov

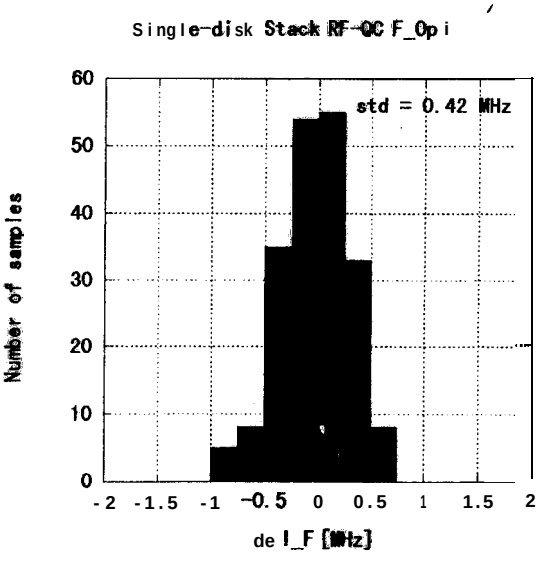

de sf∞
de sf0pi
de sf1pi
de sf20
RDD:∞ standard disks
Single disk RF-QC results
Frequency deviation from smooth [MHz]
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
50
100
150
200
Disk #

RDDS1 Single-disk RF-QC
Distribution of deviation from a smooth curve



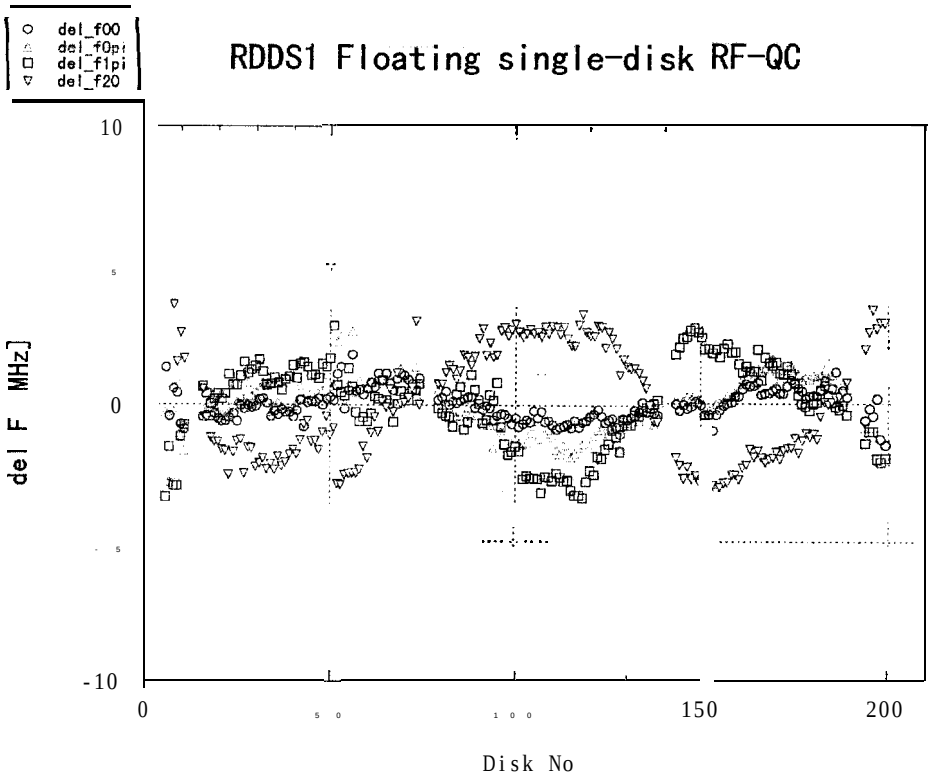


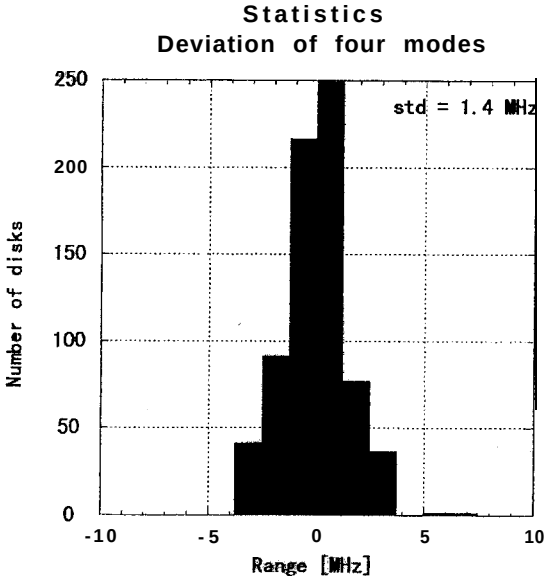


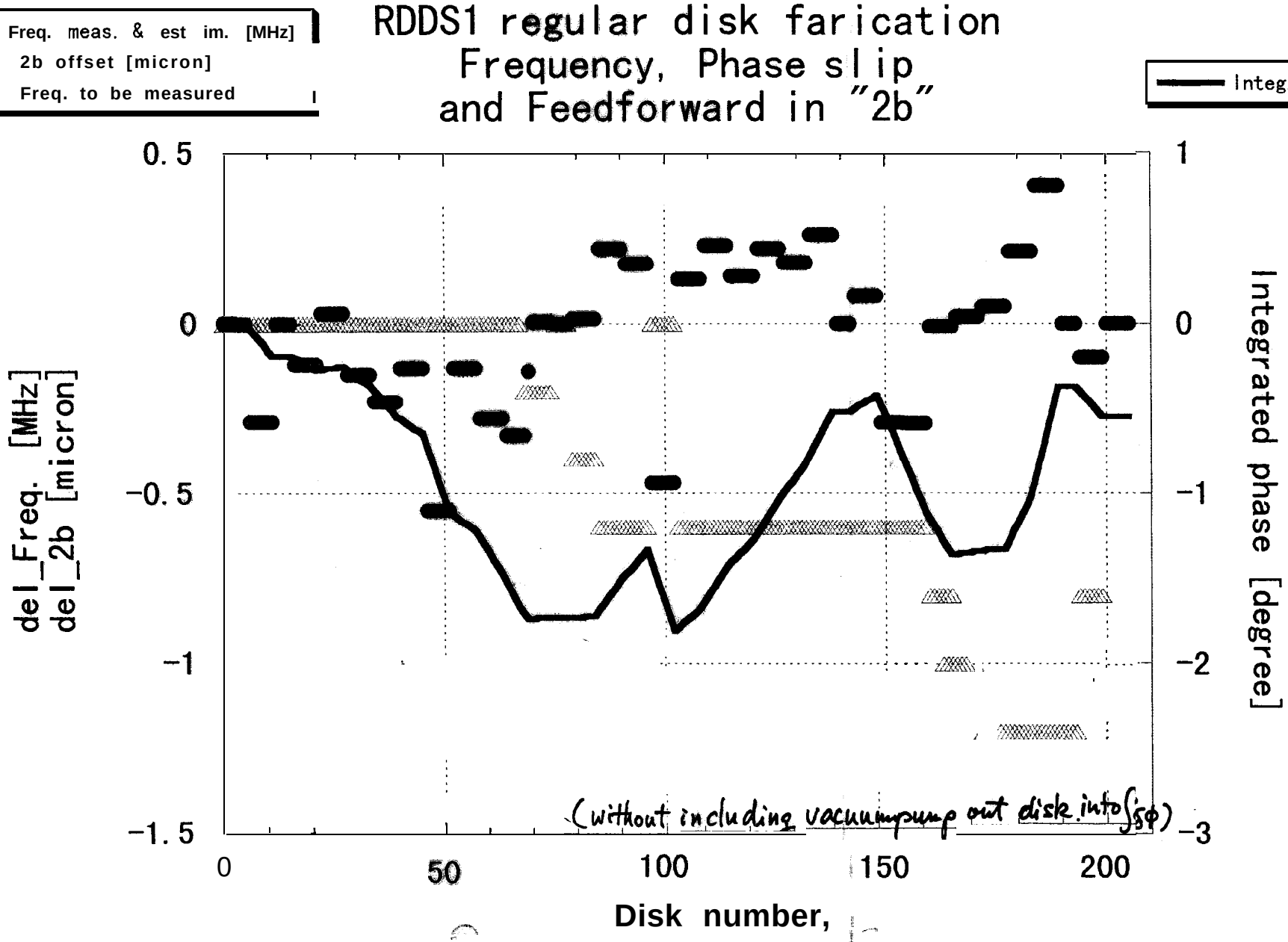


Statistics of measurement with floating setup

991206

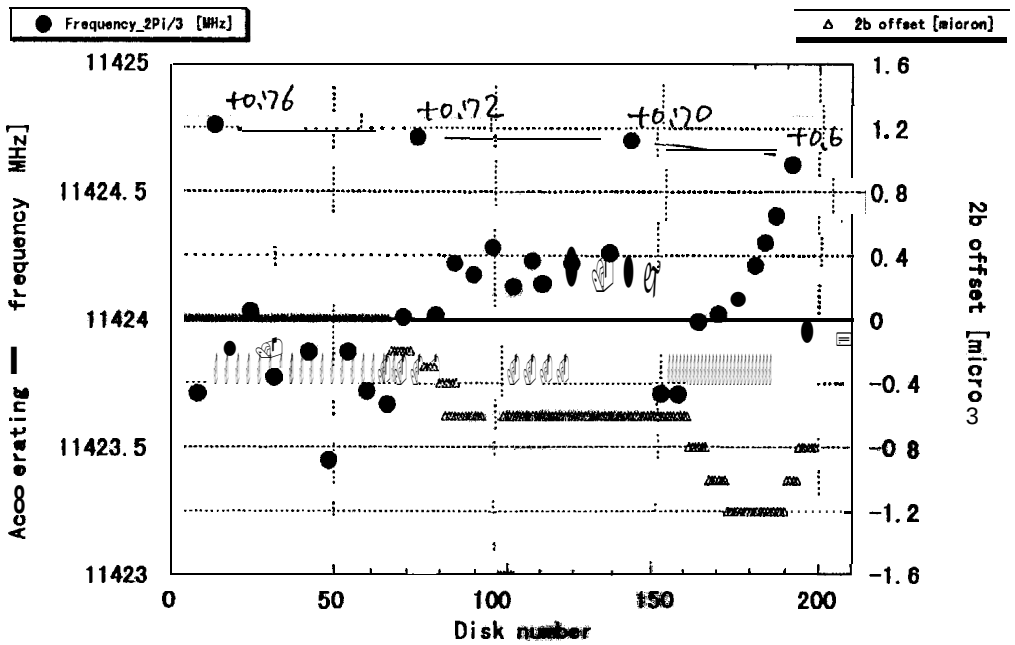




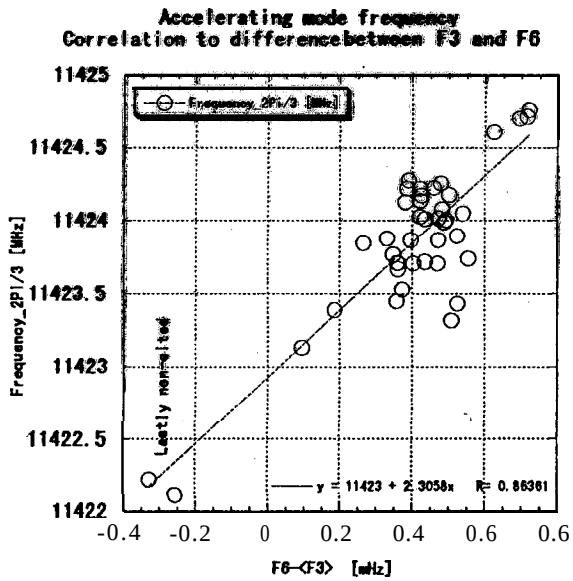

RDDS1 regular disk farication
Frequency, Phase slip
and Feedforward in "2b"
Freq. meas. & est im. [MHz]
2b offset [micron]
Freq. to be measured
Integ. phase
del_Freq. [MHz]
del_2b [micron]
Integrated phase [degree]
Disk number,
0.5
0
-0.5
-1
-1.5
1
0
-1
-2
-3
0
50
100
150
200
(without including vacuumpump out disk into ∫δφ)

991206

RDDS1 Accelerating mode frequencies



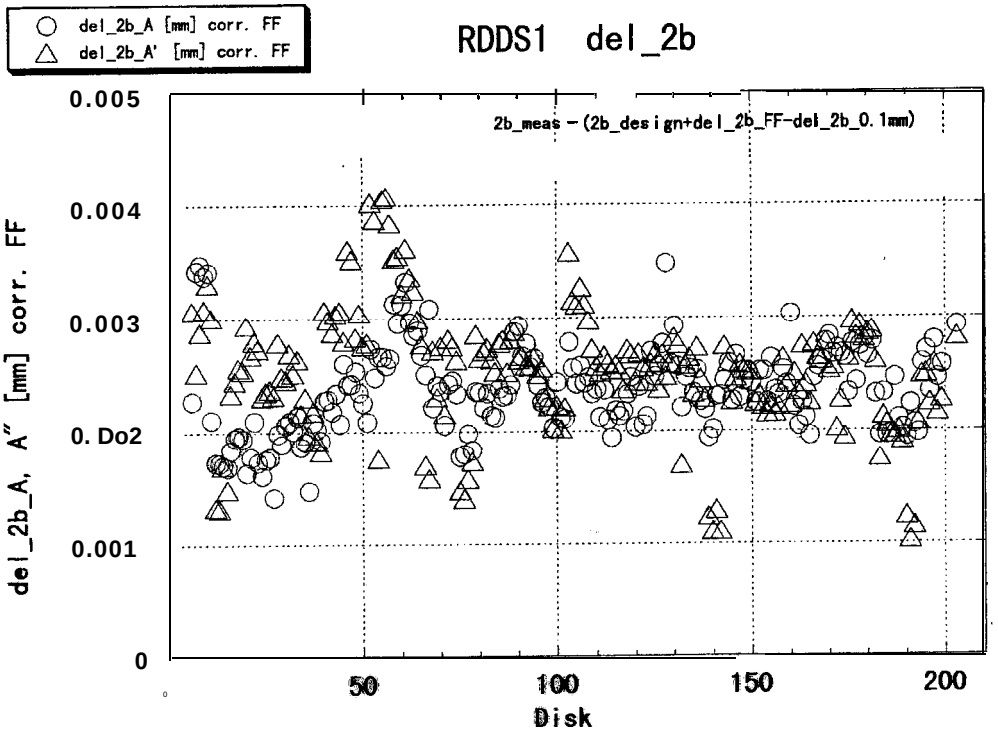
991206



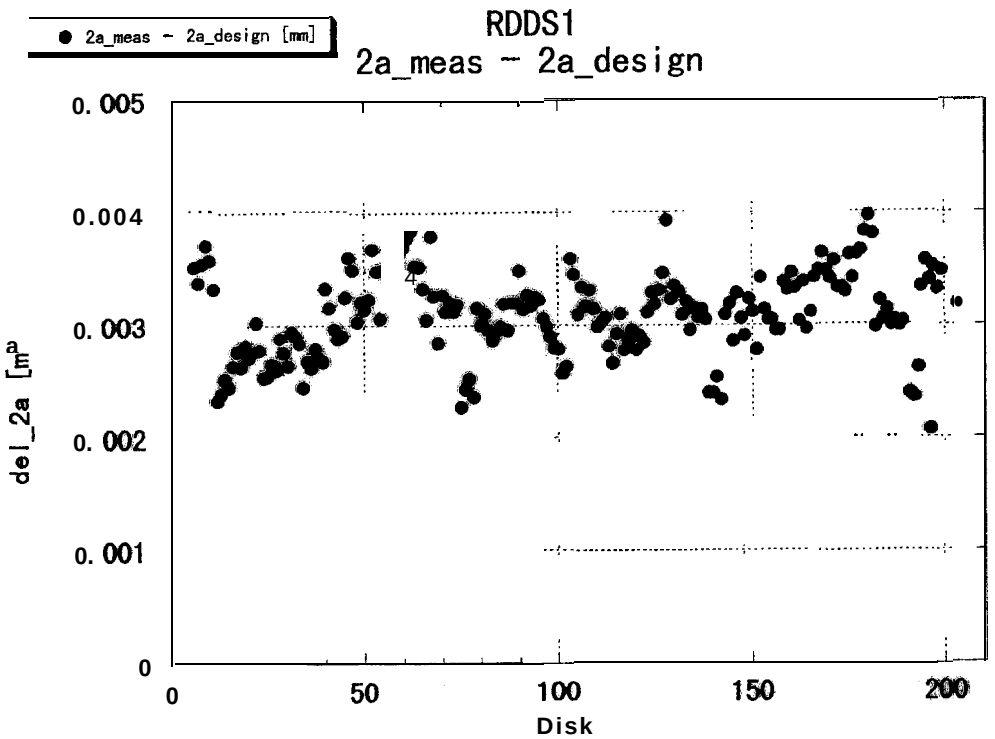
Some probably bad data were included,,

In vacuum pump out disk, large $f_6 - \langle f_3 \rangle$ and high $f_{2\pi/3}$ at the same time! We don't know why.

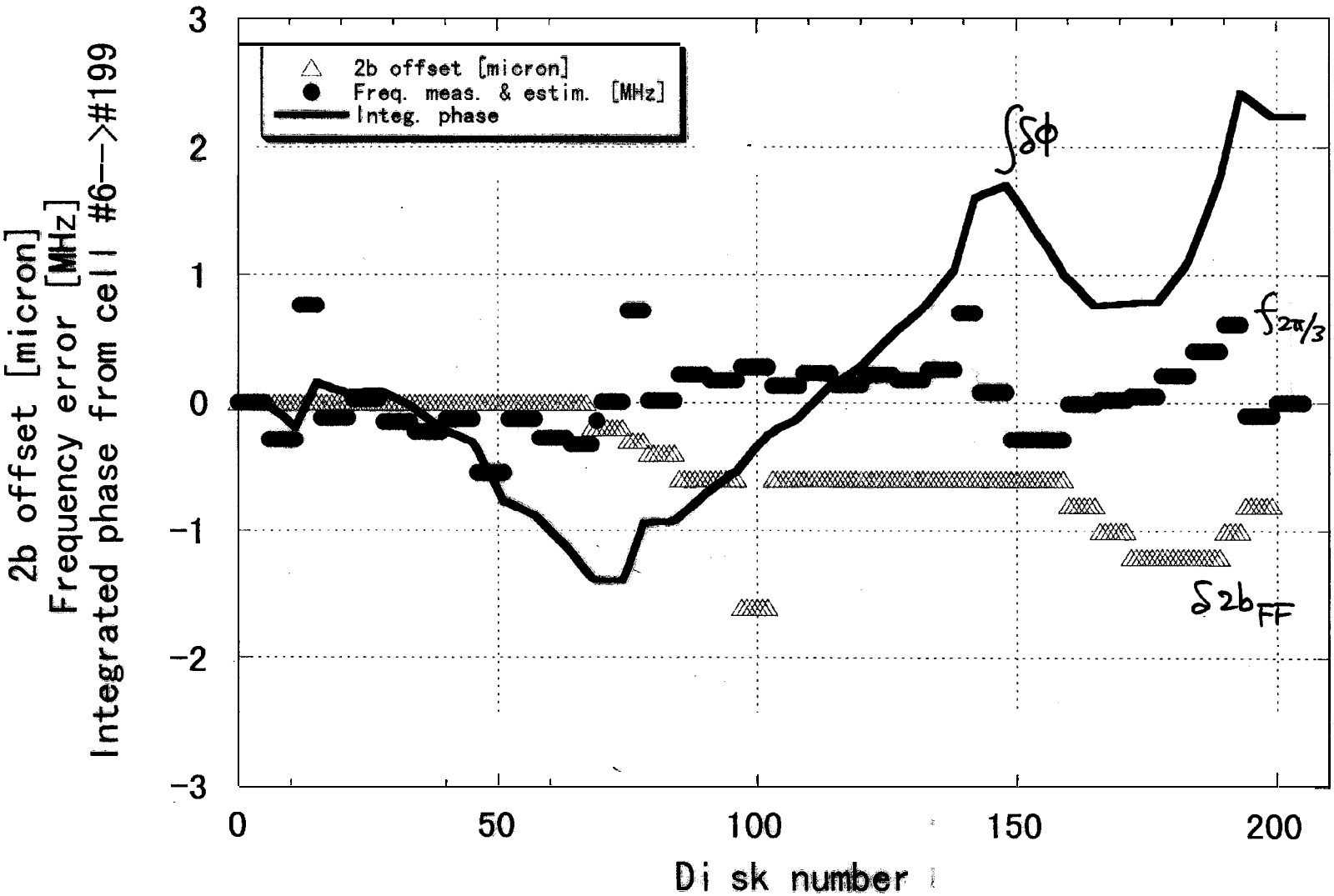
991109



991109

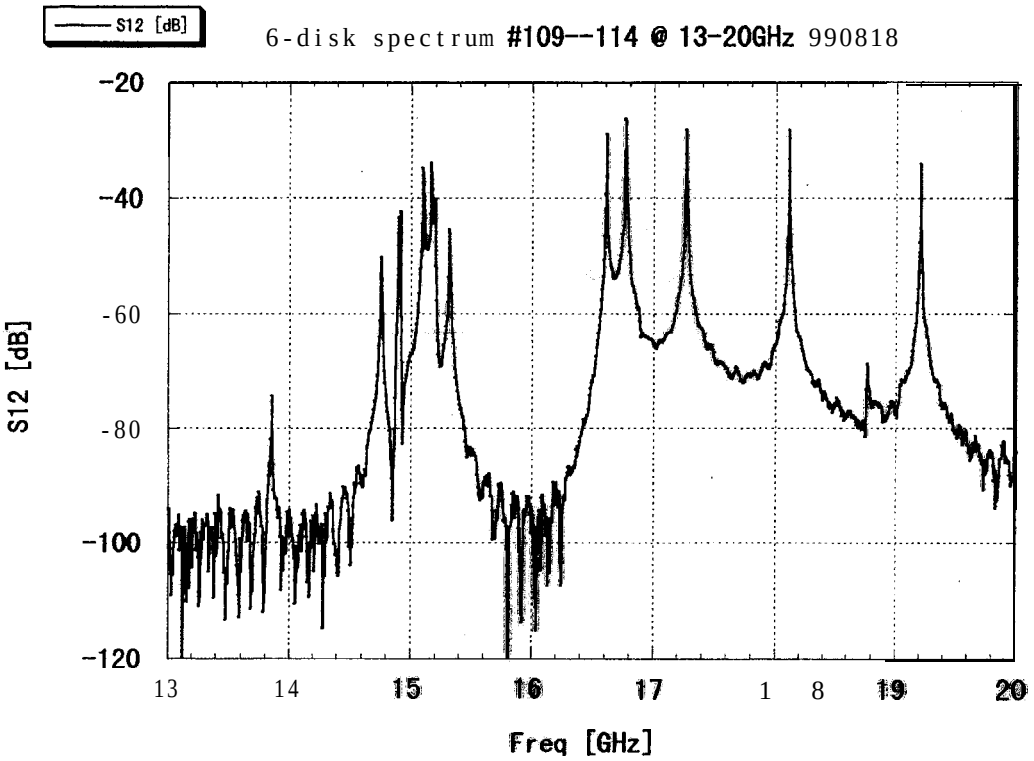


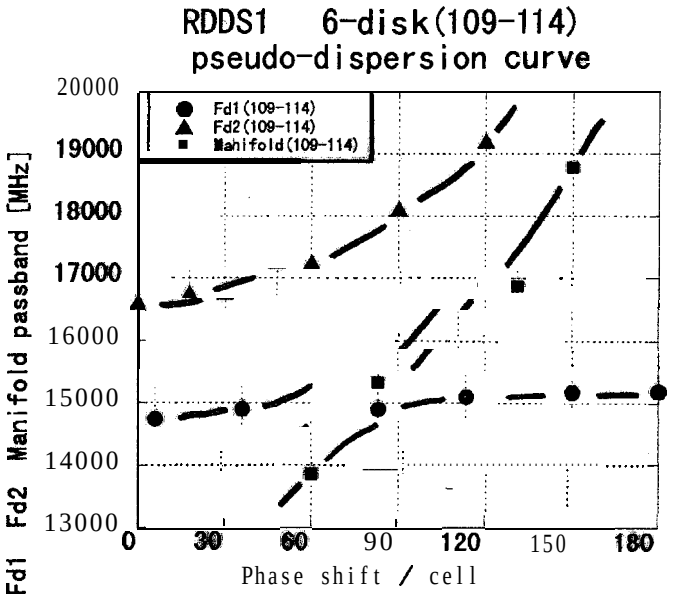
Accelerating mode frequency with feed forward in '2b' and integrated phase



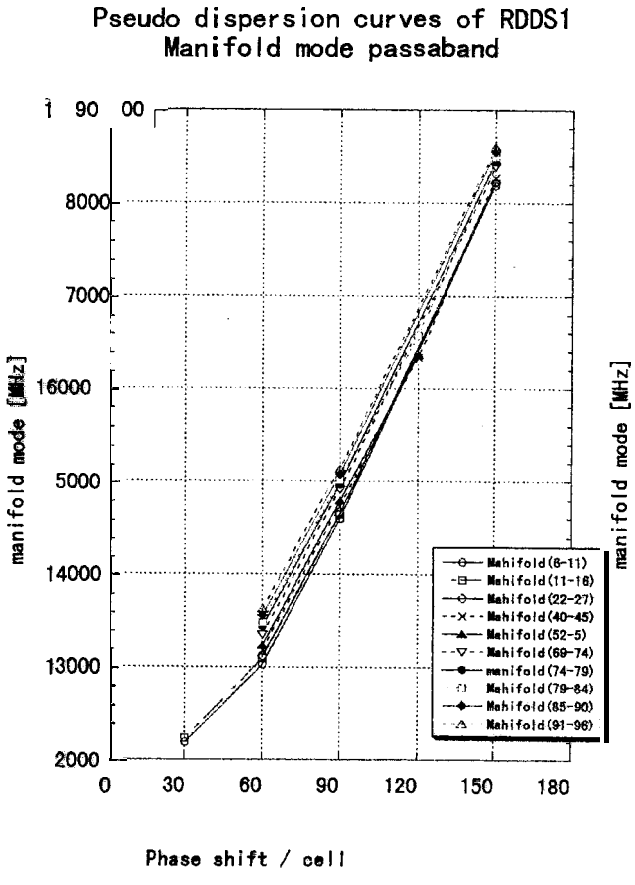
990924

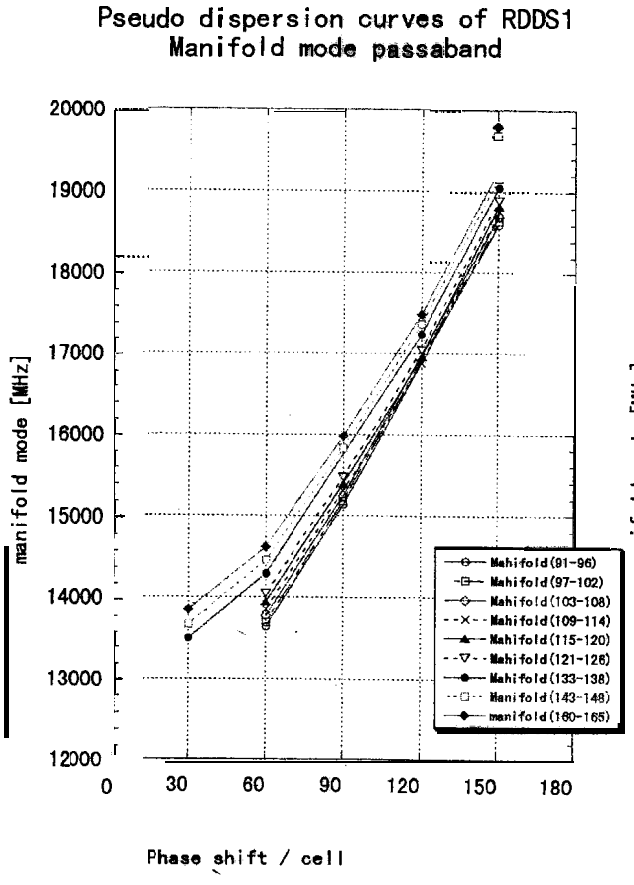
RDDS1 6-disk setup RF-QC

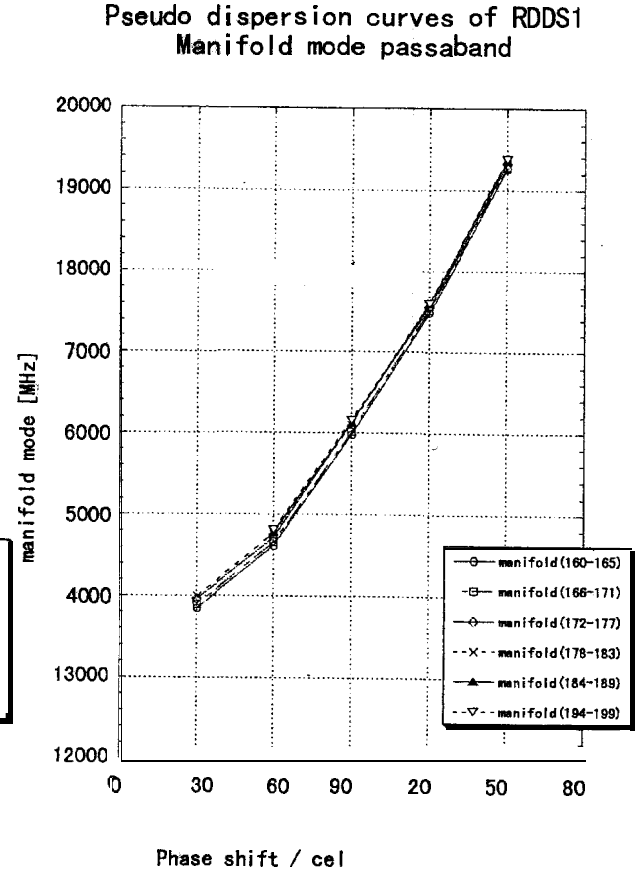




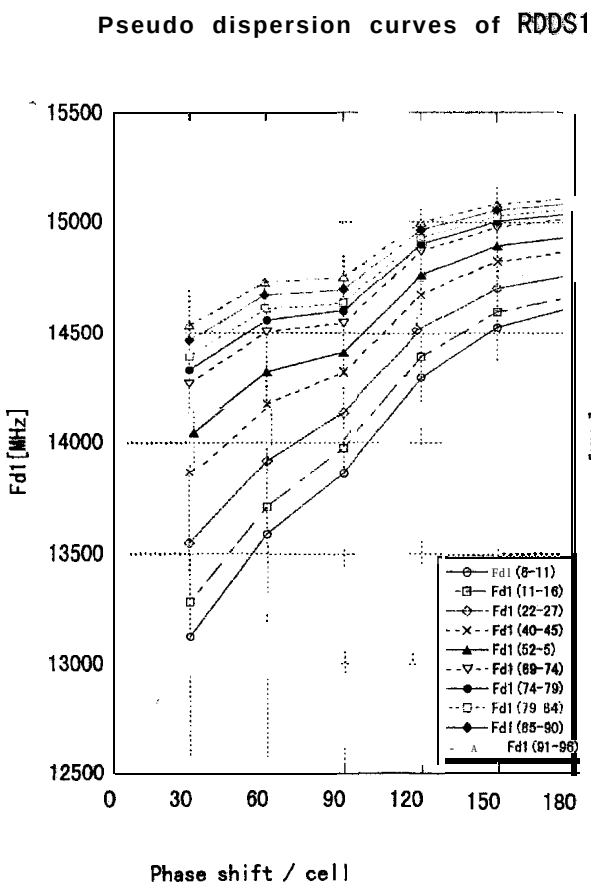
Pseudo dispersion curves of manifold mode passband of RDDS

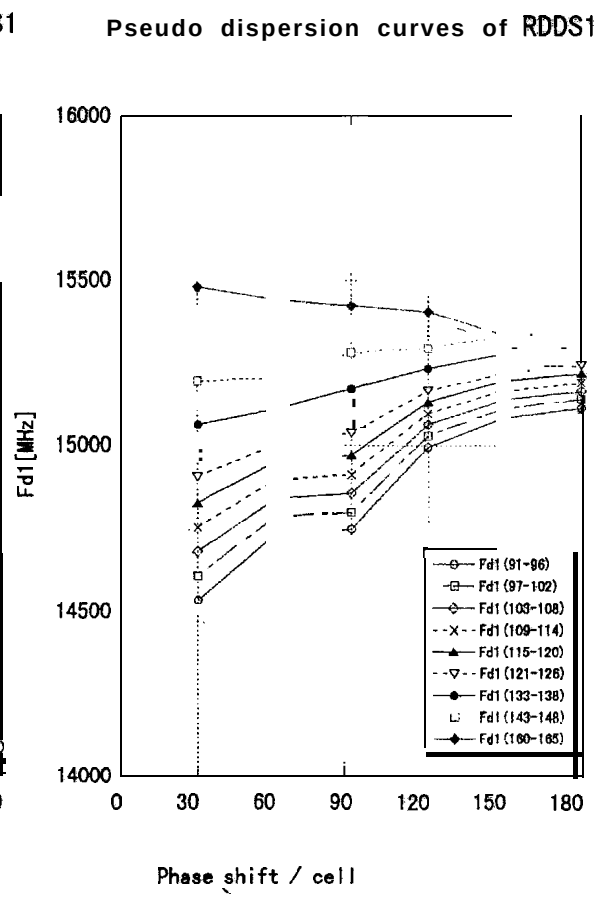


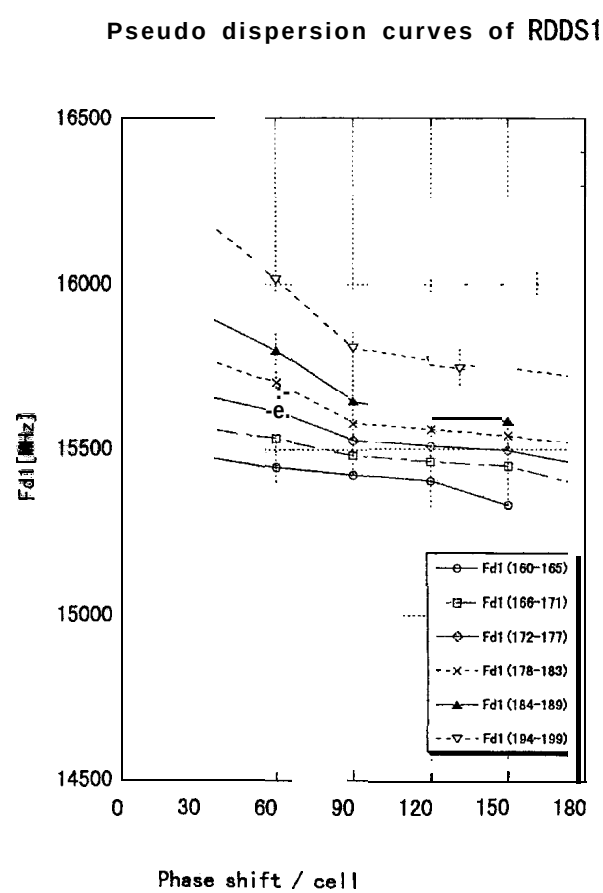




Pseudo dispersion curves of lowest dipole band of RDDS1



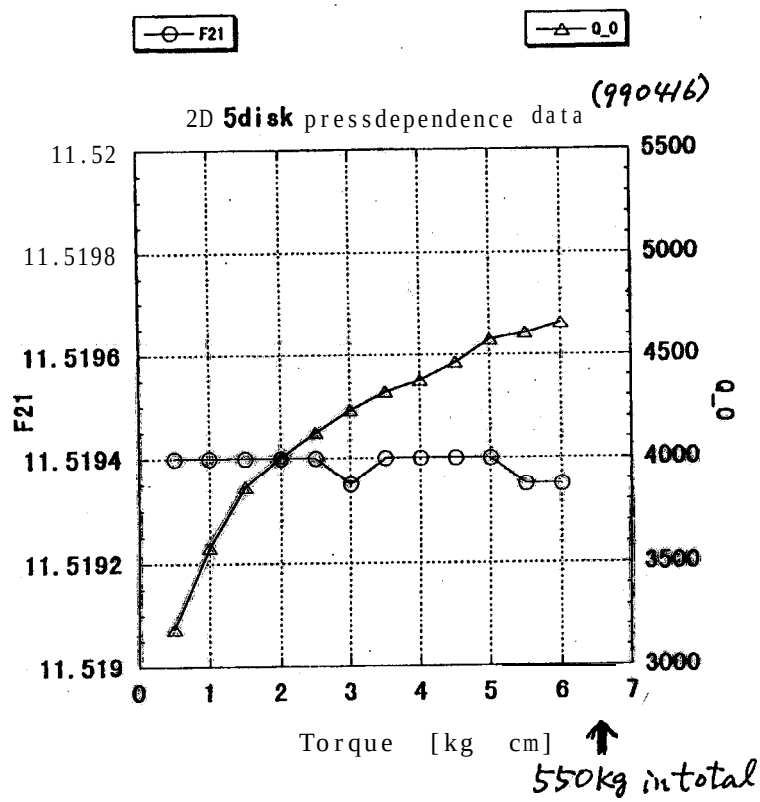




Characteristics of Stack-QC

f and Q vs. Pressure,

($\frac{4}{5}\pi$ mode in 5-disk setup)



Nominal Pressure for measuring RDDS1 was 400kg.
Can be reduced if only freq. meas.

RF-QC method
Conclusion

Stack-QC Should be utiliged in RDDS2.

1. Stable RF-QC could be realized
   In both single- and multi-disk setup.
   Due to nitrogen purge and
   quick temperature stabilization.
2. Some unknown mechanism happened
   in vacuum pump-out disks.
3. Frequency reading was saturated above 50kg.
   Can be reduced from 400kg → 100kg.
4. Deterioration of mating surfaces was evident.
   → Need better cleanness.
5. Bumps at outside edge due to collision with V-block.
   Make soft V-face with dust free.
6. A little more than 1 minutes for one disk.
   Need to make it faster and easy operation.
7. Jigging should be improved.
   Wide space for handling.
   Under clean circumference.
   Use end plates with hard-surface.
   Easy pressure mechanism.
   Teflon V-surface.
   Fixed probes.
   Better rotational alignment.

Floating QC Should be improved before RDDS2.

1. Large deviation from smooth curve. Need understand the excited field for measurement.

Possible RF-QC for future RDDS

1. Stack setup with 3-6-12 disks.
   Confirmation of linearity.
   Where coupling information is needed.
   coupling info. in RDDS1 was enough ?

2. How to Control integrated phase advance?
   Feed-forward works onlv in slow production rate.
   RDDS2, 3 -- are ok with FF.

3. F_{d1} systematic error evaluation.
   Calculate with precise 3D code to fix dimension.
   Check those pivot points along the structure.

4. Information 0f F_{d3} and F_{d6}.
   Stack QC up to 30—40 GHz region. Not possible with present NA.

5. Manifold information excited from manifold? ? No need ?

6.