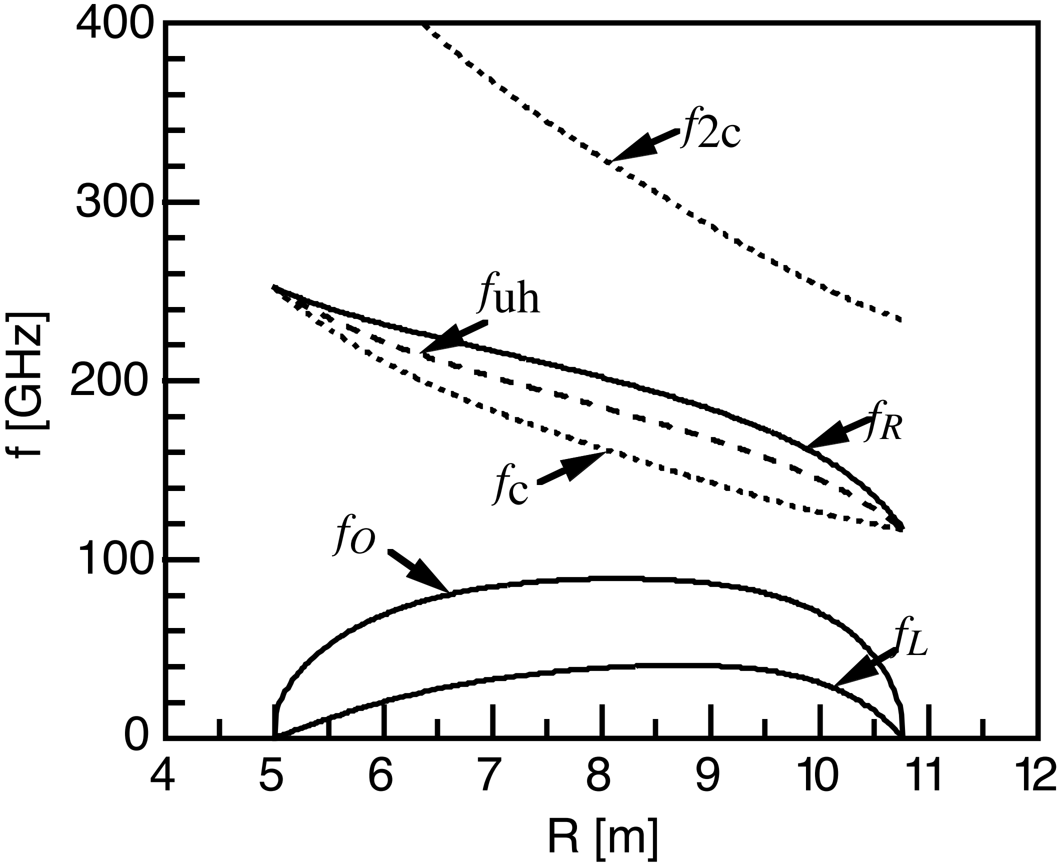


Fig. 1

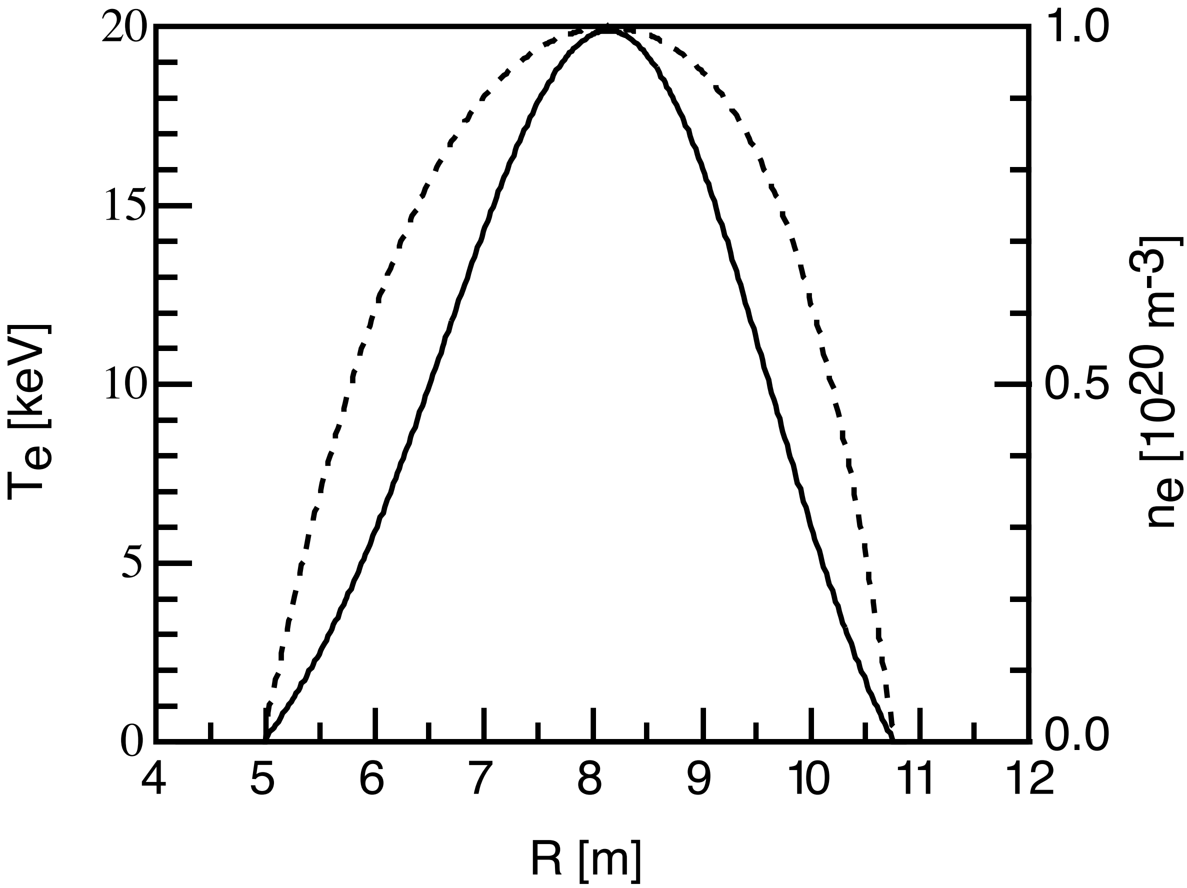


Fig. 2

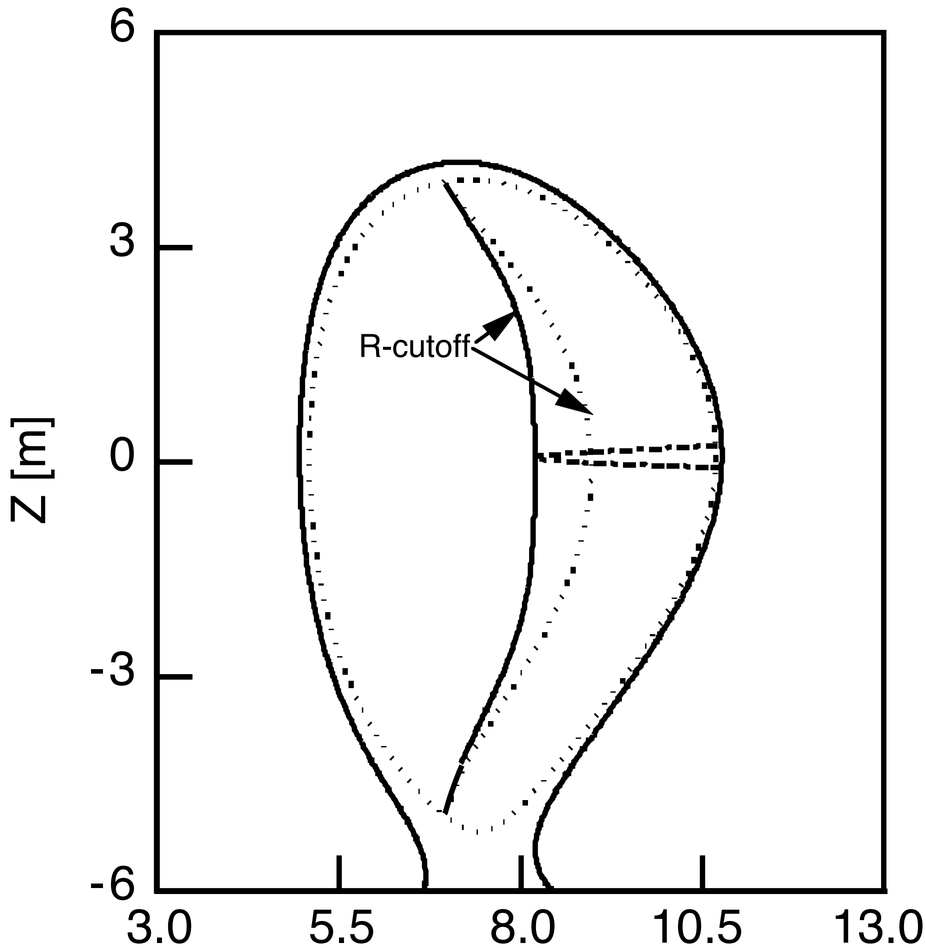


Fig. 3

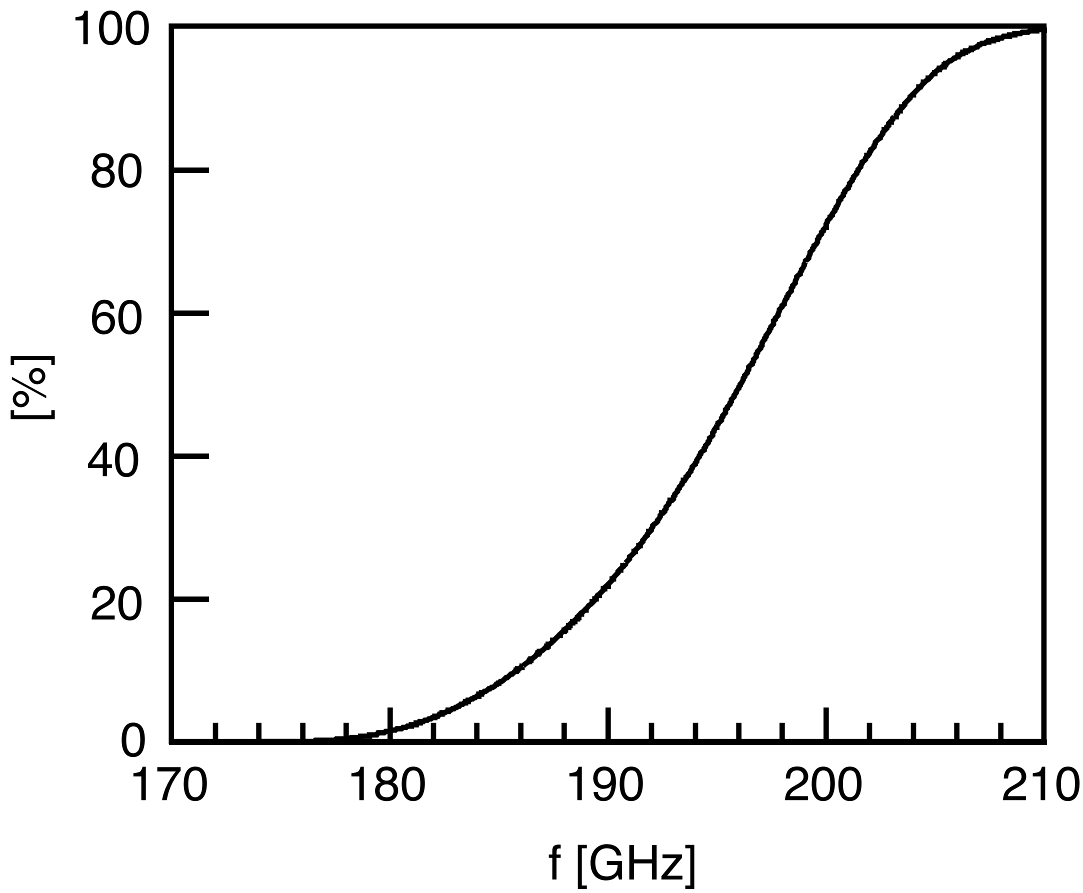


Fig. 4

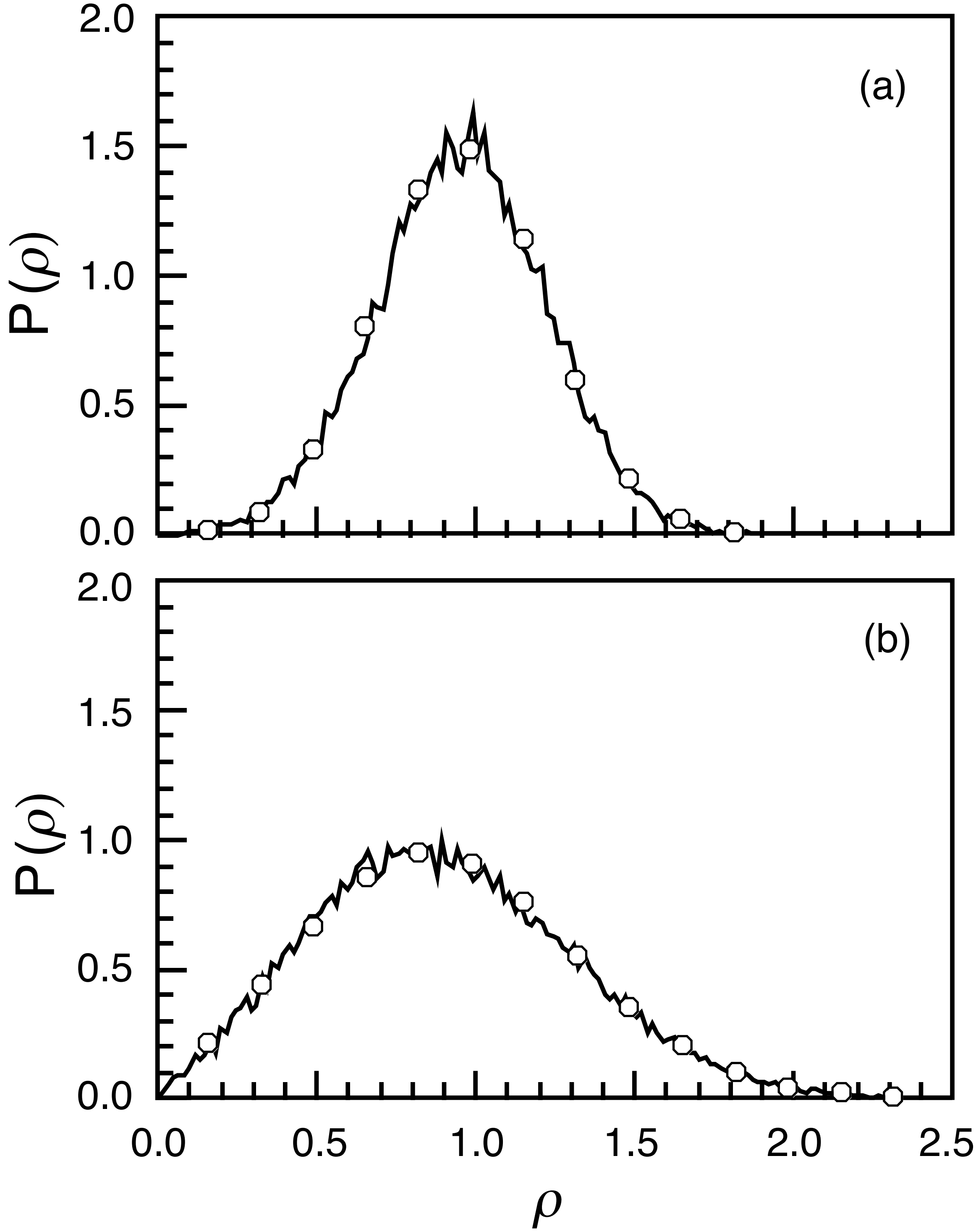


Fig. 5

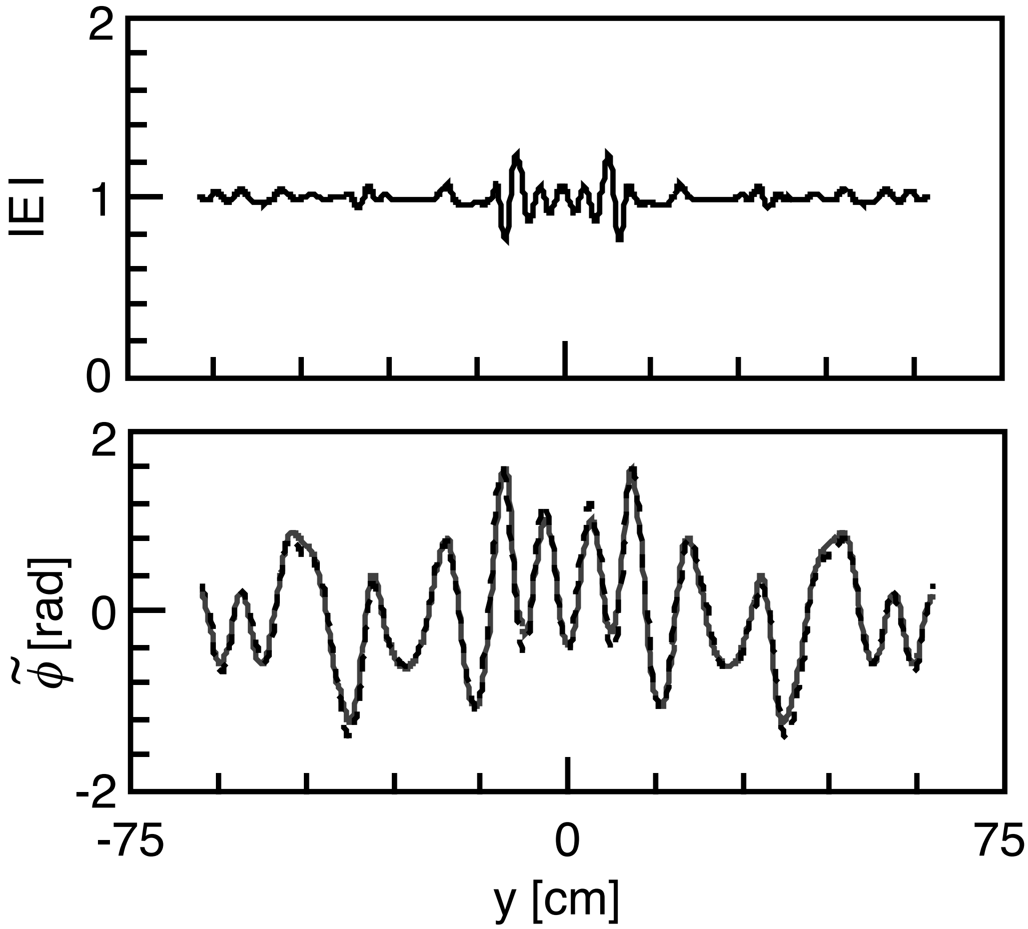


Fig. 6

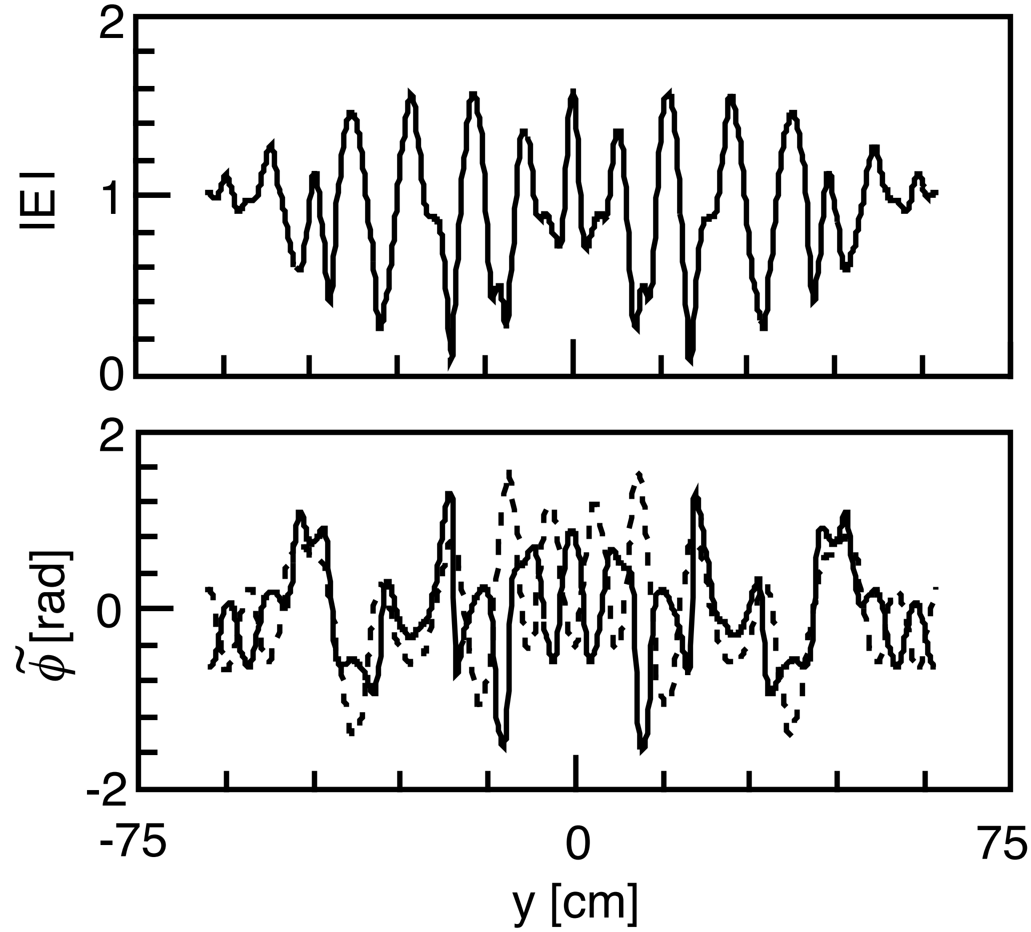


Fig. 7

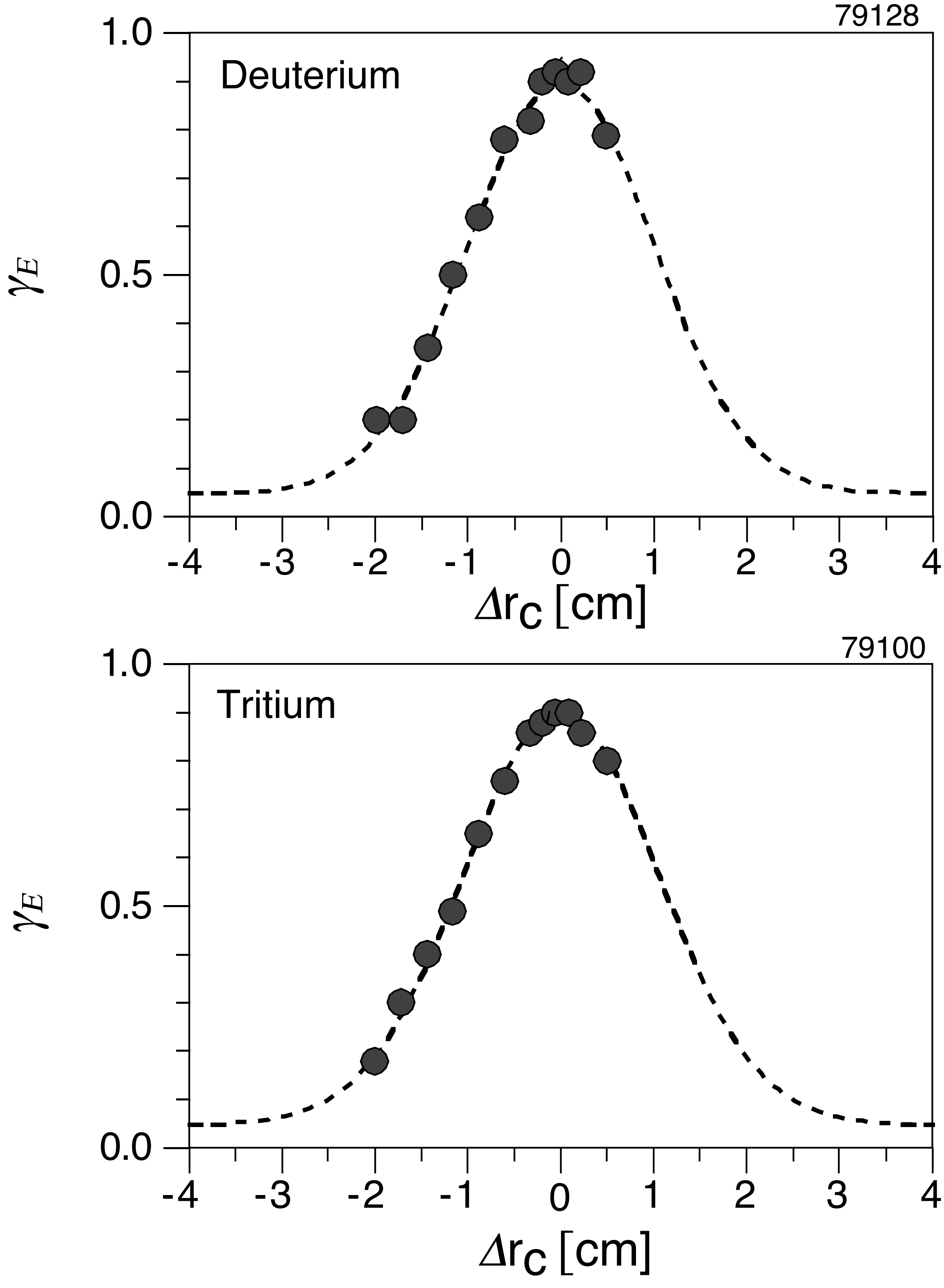

79128
1.0
0.5
0.0
Deuterium
γ_E
-4
-3
-2
-1
0
1
2
3
4
Δr_C [cm]
79100
1.0
0.5
0.0
Tritium
γ_E
-4
-3
-2
-1
0
1
2
3
4
Δr_C [cm]

Fig. 8

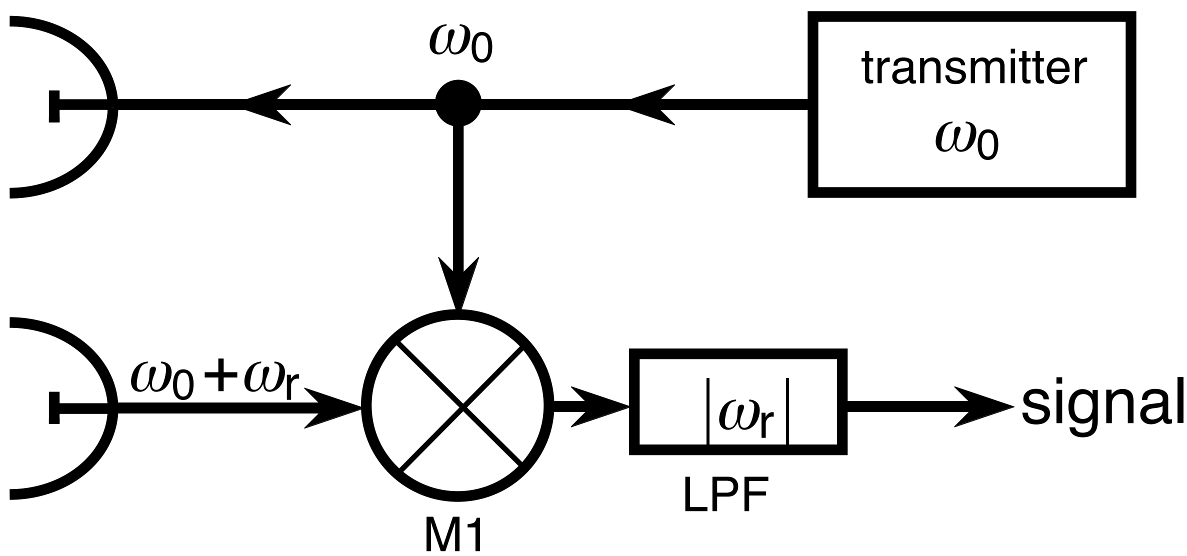

ω_0
transmitter
ω_0
$\omega_0+\omega_r$
$|\omega_r|$
signal
LPF
M1

Fig. 9

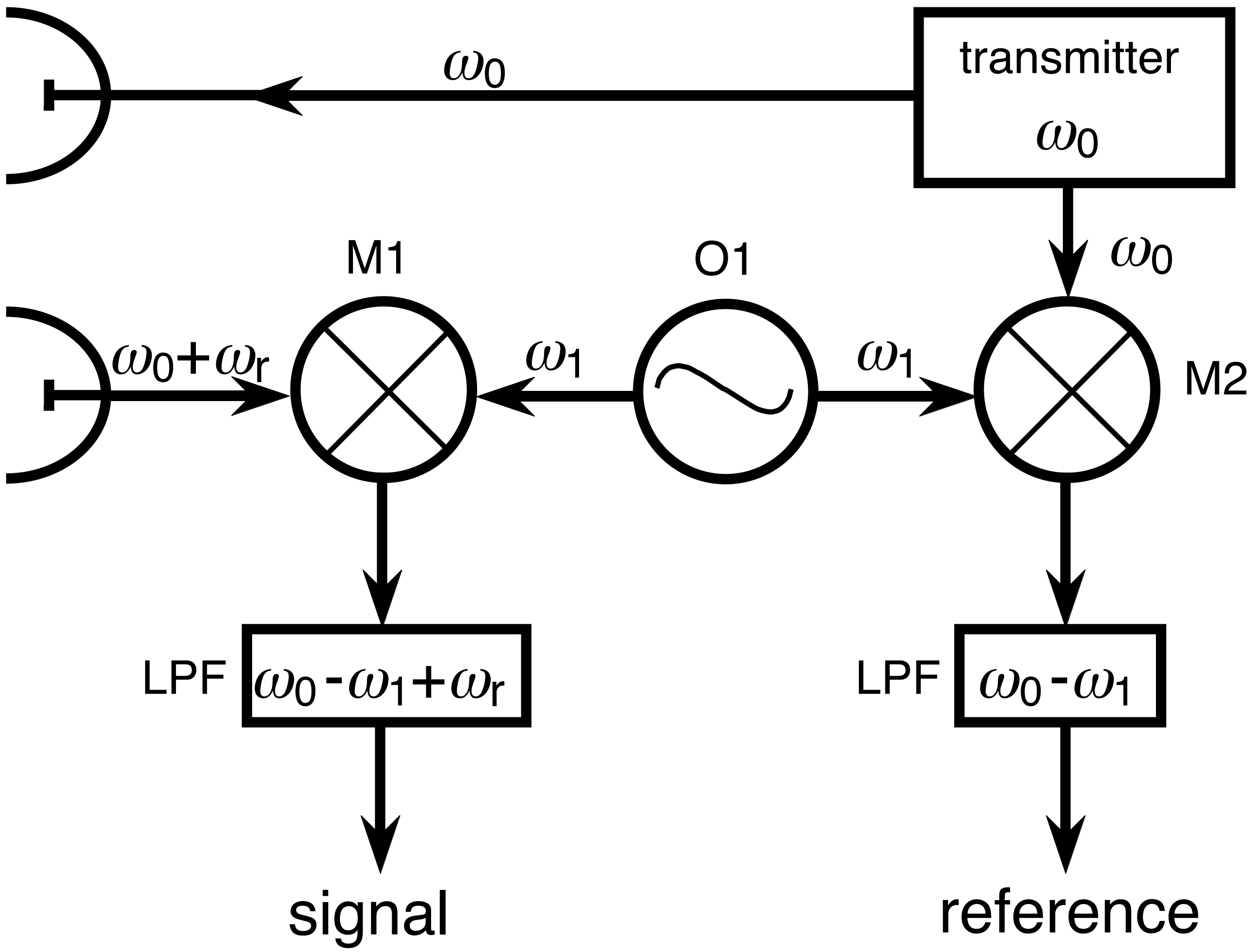
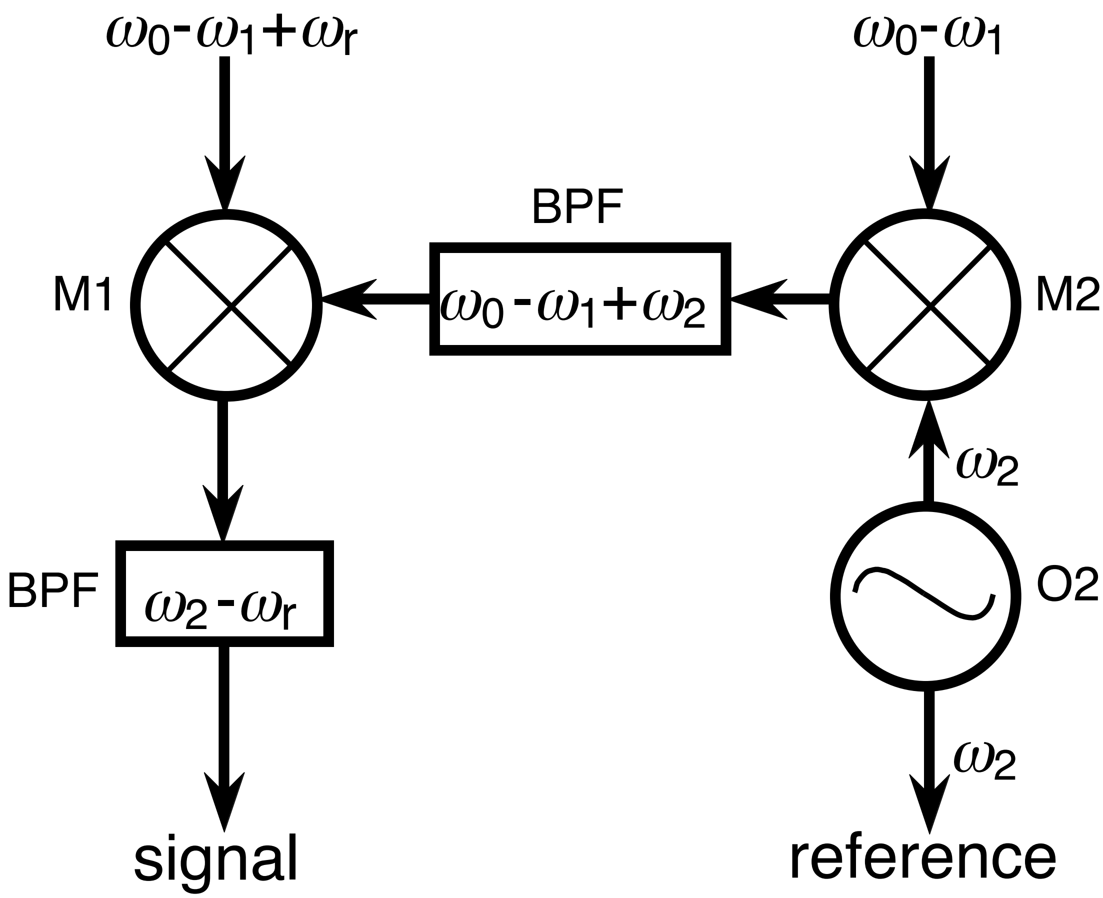

ω_0
transmitter
ω_0
ω_0
M1
O1
$\omega_0+\omega_r$
ω_1
ω_1
M2
LPF
ω_0-ω_1+ω_r
LPF
ω_0-ω_1
signal
reference

Fig. 10



ω_0-ω_1+ω_r
ω_0-ω_1
BPF
M1
ω_0-ω_1+ω_2
M2
ω_2
BPF
ω_2-ω_r
O2
ω_2
signal
reference

Fig. 11

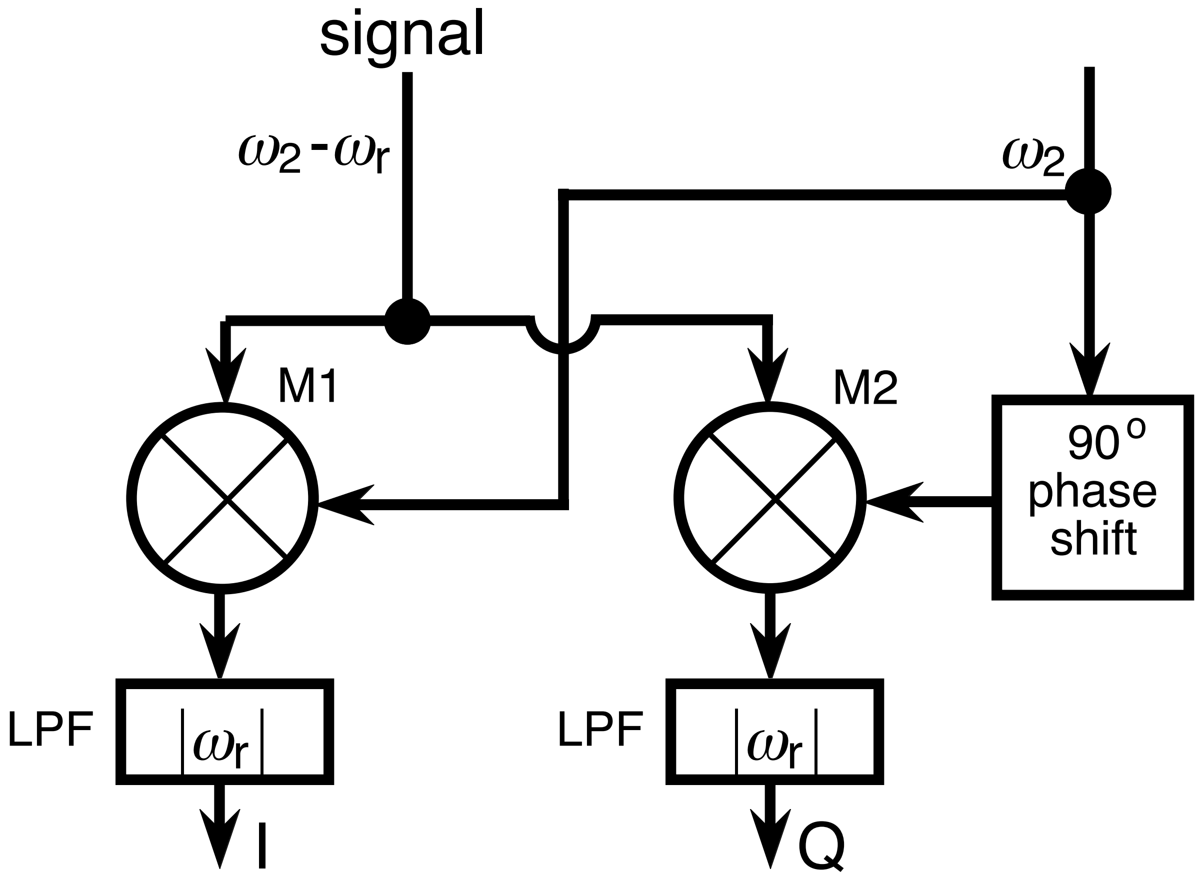

signal
$\omega_2 - \omega_r$
ω_2
M1
M2
90^o phase shift
LPF
$|\omega_r|$
LPF
$|\omega_r|$
I
Q

Fig. 12

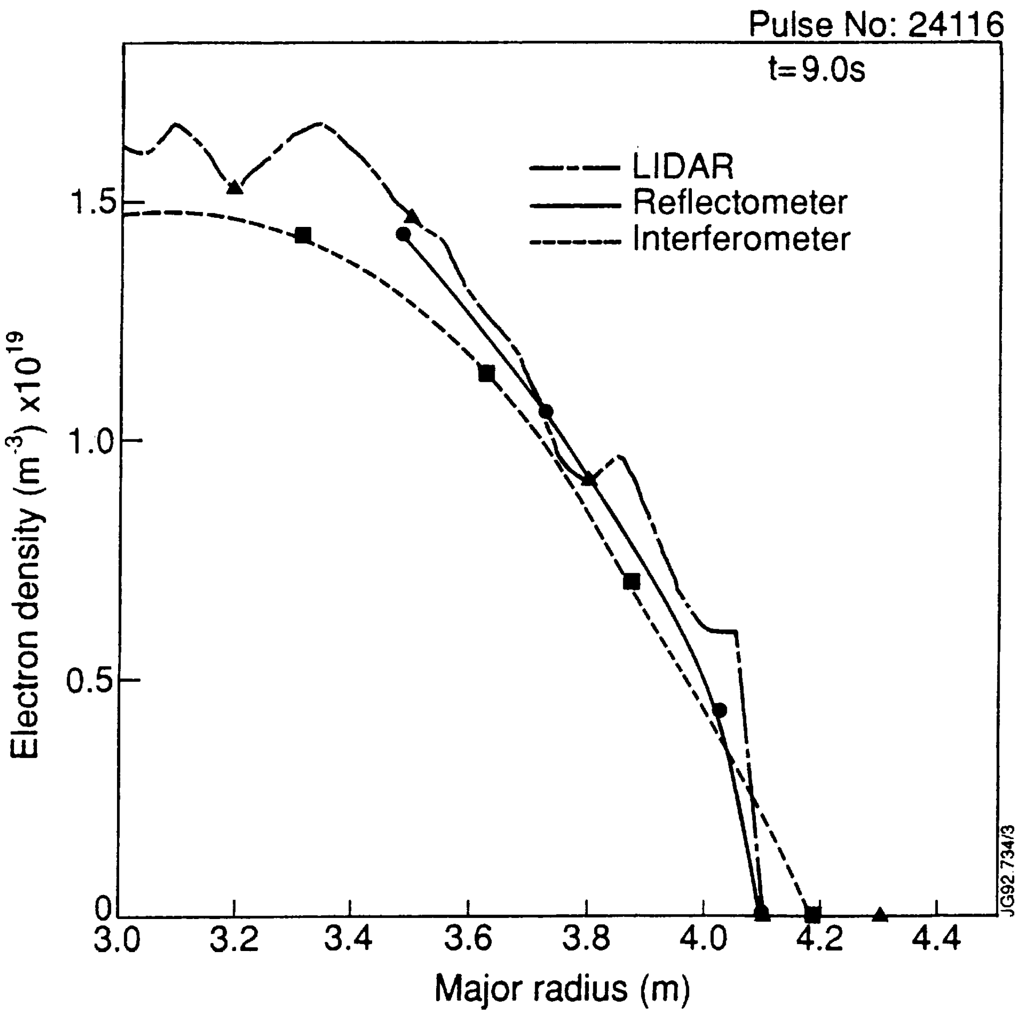
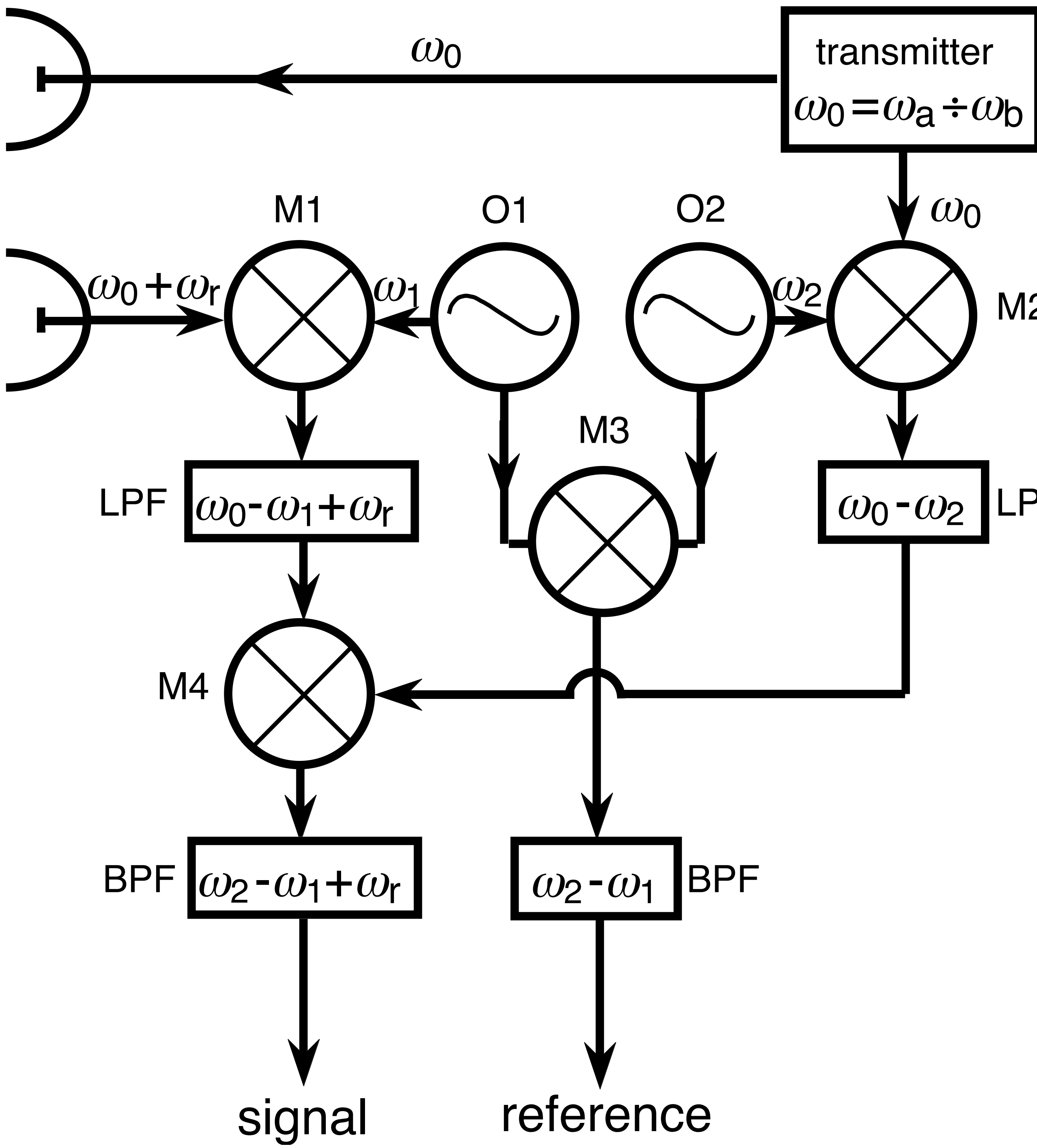

Pulse No: 24116
t=9.0s
LIDAR
Reflectometer
Interferometer
1.5
1.0
0.5
0
3.0
3.2
3.4
3.6
3.8
4.0
4.2
4.4
Electron density (m^{-3}) x10^{19}
Major radius (m)
JG92.734/3

Fig. 13



ω_0
transmitter
$\omega_0 = \omega_a \div \omega_b$
ω_0
M1
O1
O2
$\omega_0 + \omega_r$
ω_1
ω_2
M2
M3
LPF
$\omega_0 - \omega_1 + \omega_r$
$\omega_0 - \omega_2$
LPF
M4
BPF
$\omega_2 - \omega_1 + \omega_r$
$\omega_2 - \omega_1$
BPF
signal
reference

Fig. 14

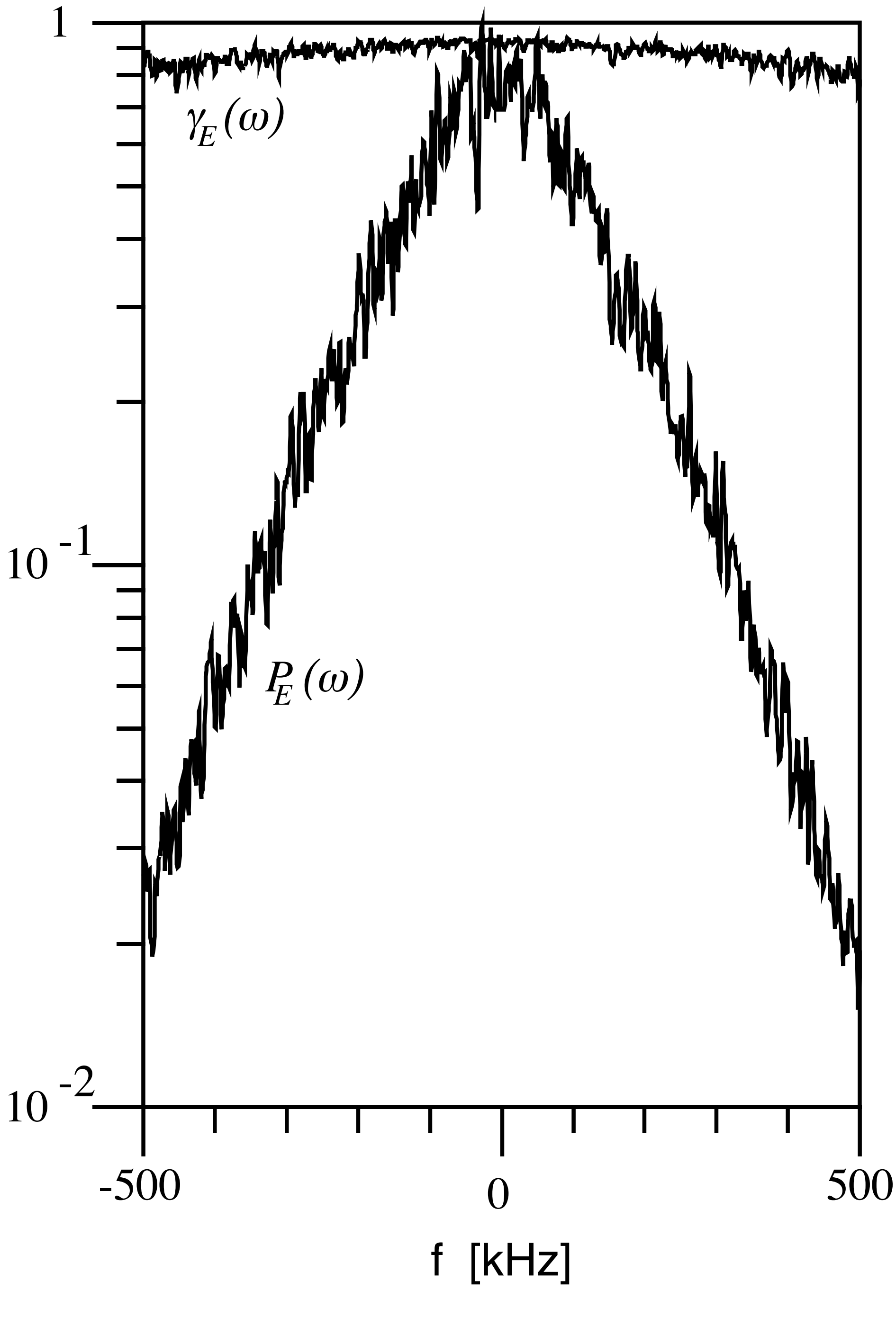
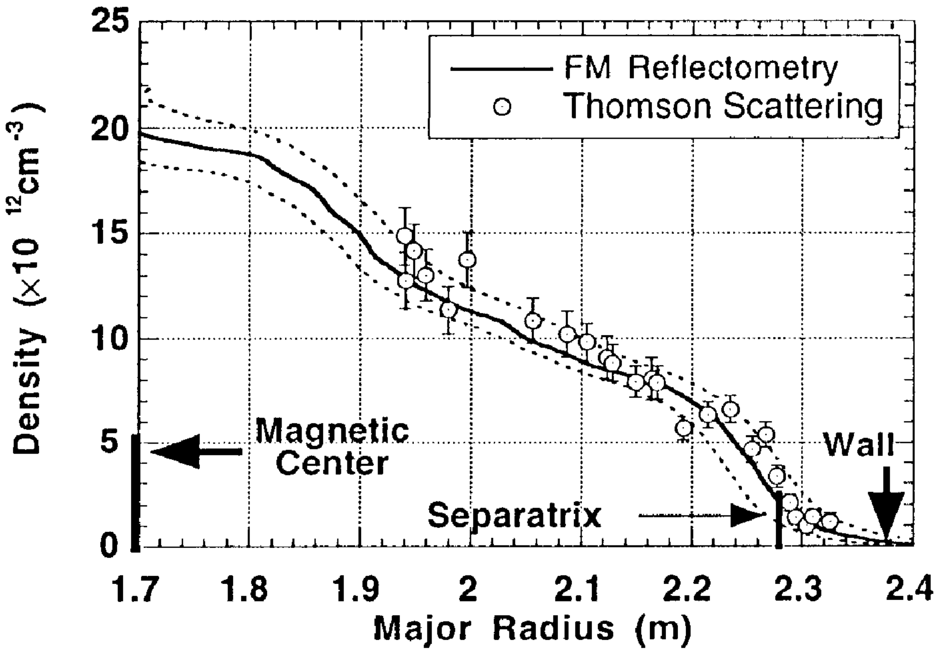
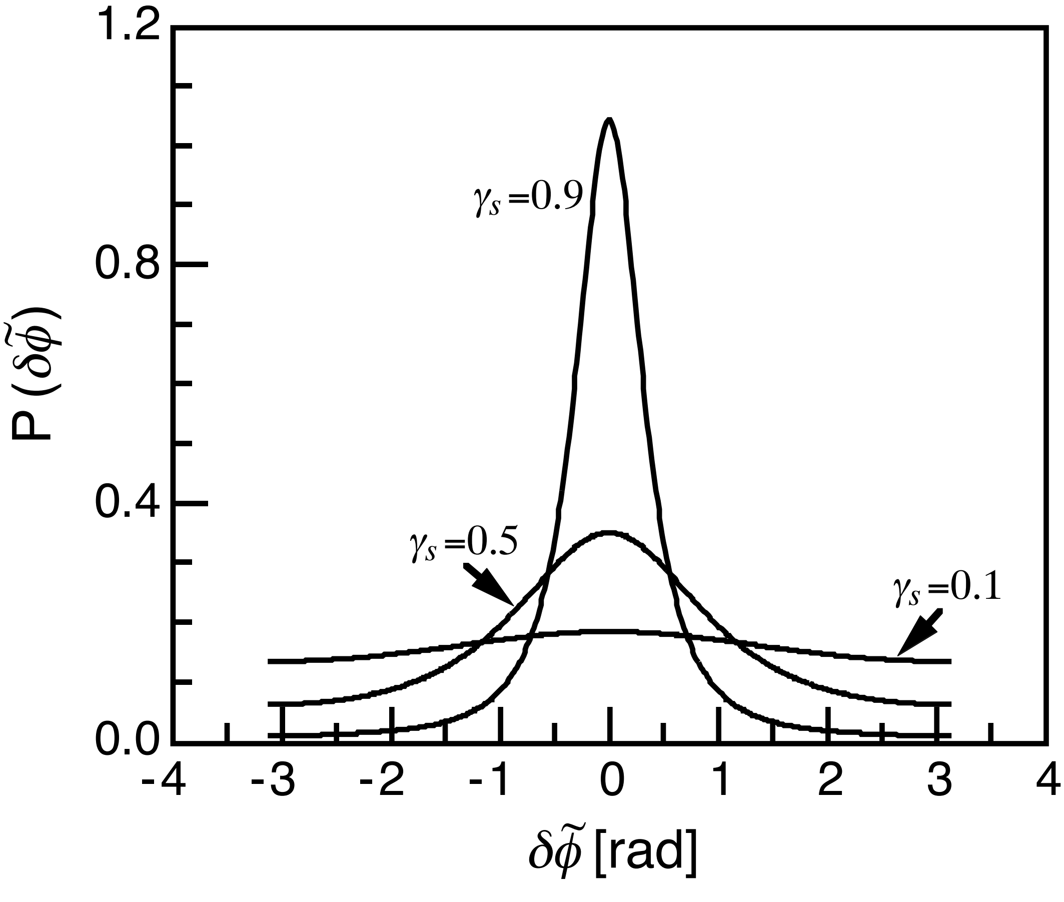


Fig. 15



FM Reflectometry
Thomson Scattering
Density (×10 ¹²cm⁻³)
Major Radius (m)
Magnetic
Center
Separatrix
Wall
25
20
15
10
5
0
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4

Fig. 16



1.2
0.8
0.4
0.0
-4
-3
-2
-1
0
1
2
3
4
$P\,(\delta\tilde{\phi})$
$\delta\tilde{\phi}$ [rad]
$\gamma_s = 0.9$
$\gamma_s = 0.5$
$\gamma_s = 0.1$

Fig. 17

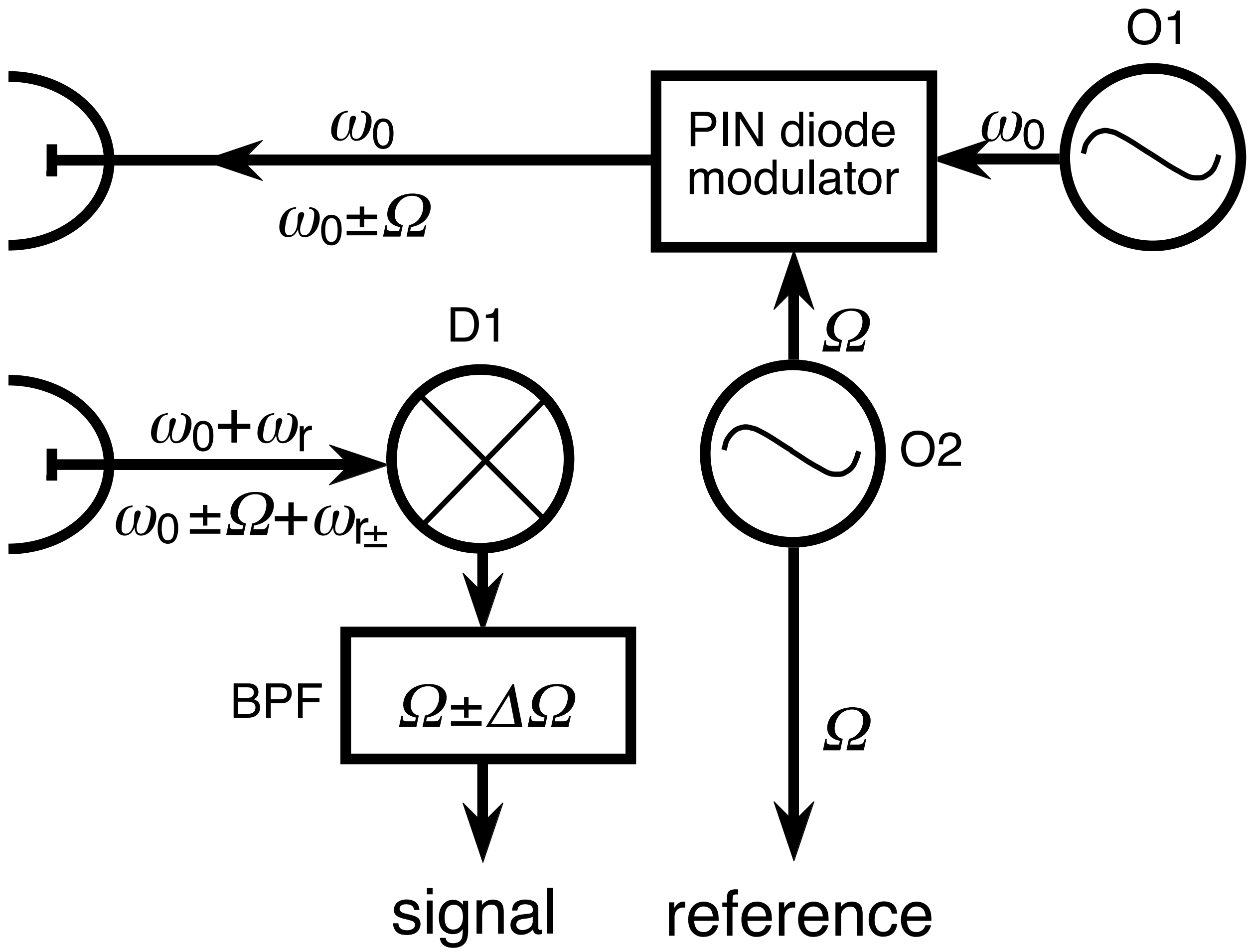
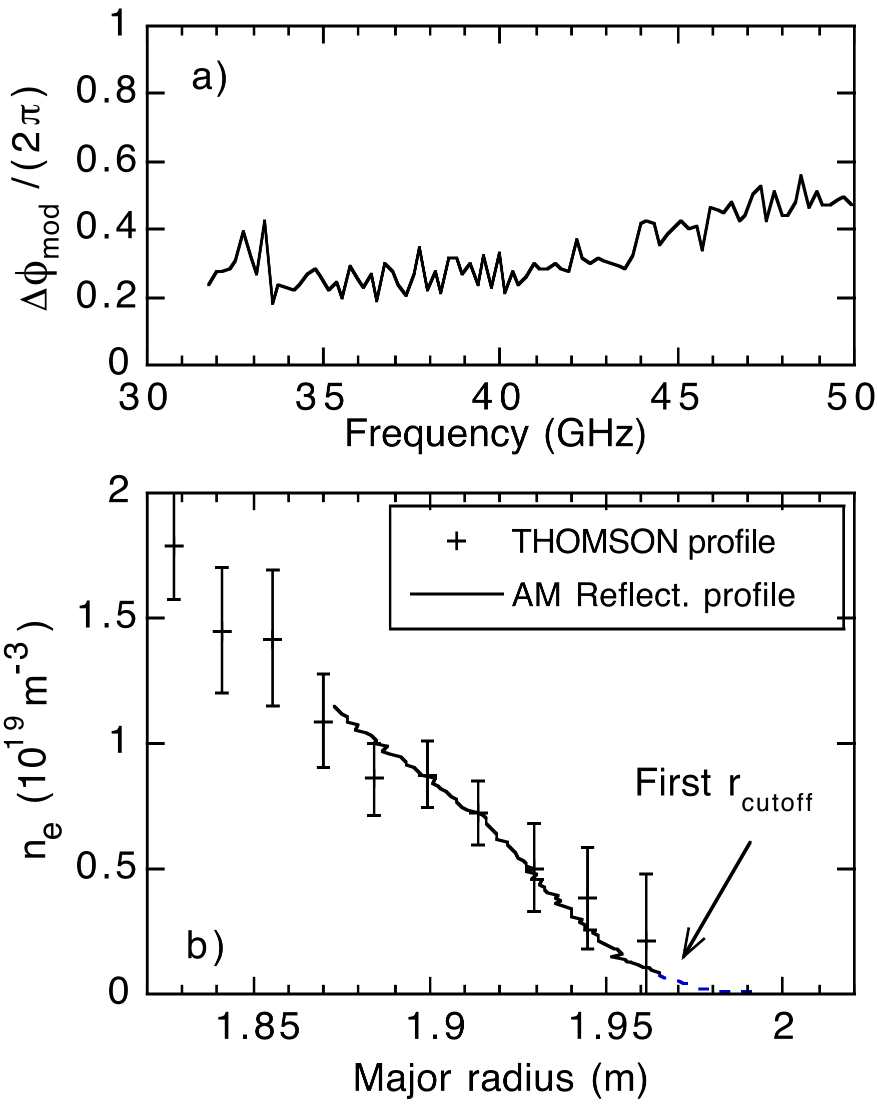
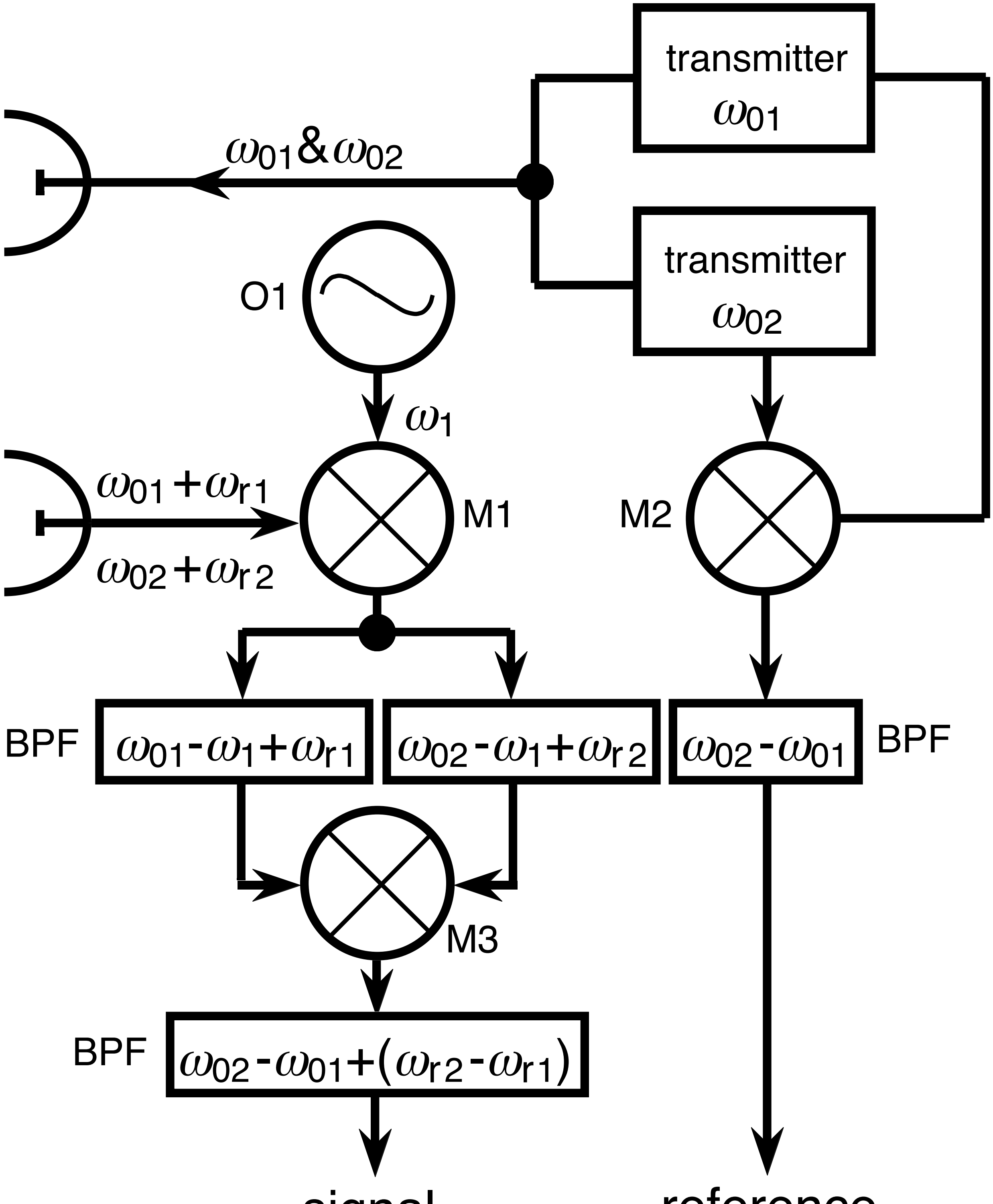

O1
PIN diode modulator
ω_0
ω_0
$\omega_0 \pm \Omega$
D1
Ω
$\omega_0 + \omega_r$
O2
$\omega_0 \pm \Omega + \omega_{r\pm}$
BPF
$\Omega \pm \Delta\Omega$
Ω
signal
reference

Fig. 18



a)
$\Delta\phi_{mod}/(2\pi)$
Frequency (GHz)
b)
THOMSON profile
AM Reflect. profile
First r_{cutoff}
n_e (10^{19} m^{-3})
Major radius (m)

Fig. 19



transmitter
ω01
transmitter
ω02
ω01&ω02
O1
ω1
ω01+ωr1
ω02+ωr2
M1
M2
BPF
ω01-ω1+ωr1
ω02-ω1+ωr2
ω02-ω01
BPF
M3
BPF
ω02-ω01+(ωr2-ωr1)
signal
reference

Fig. 20

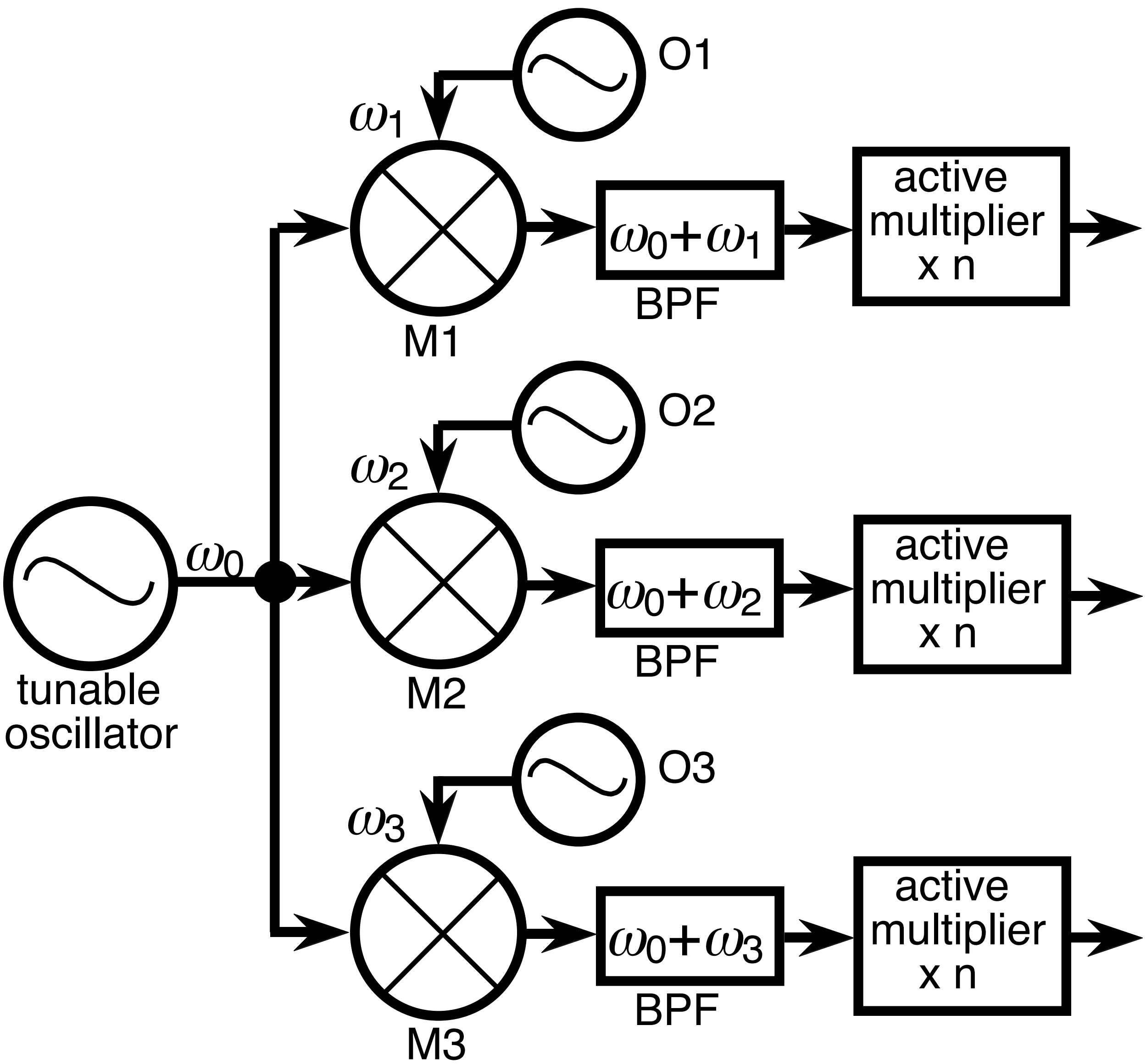
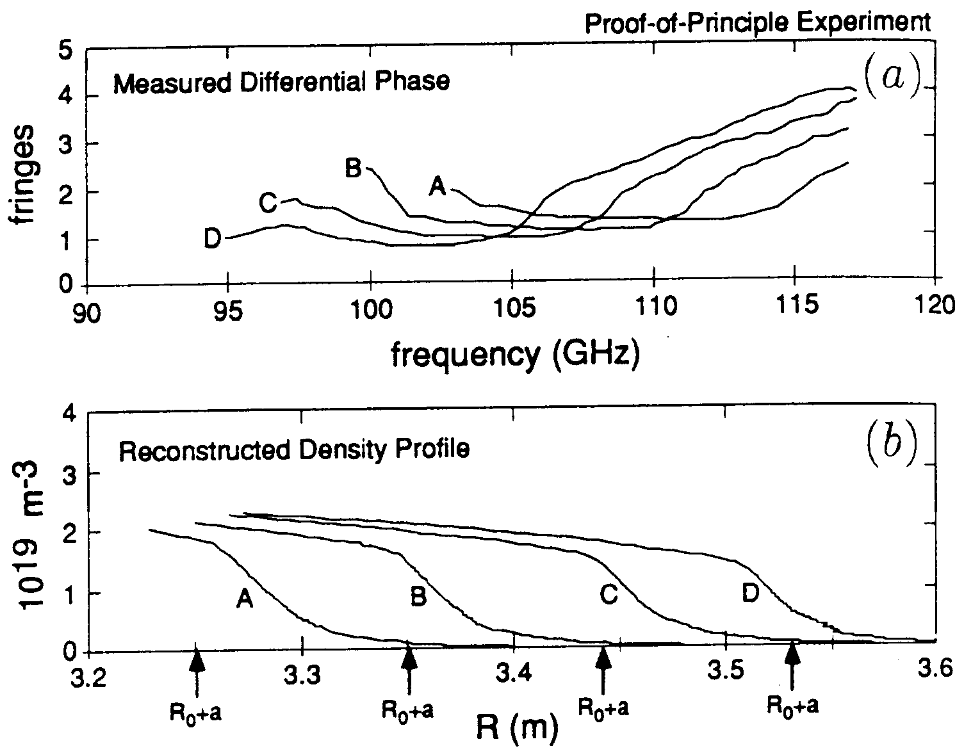
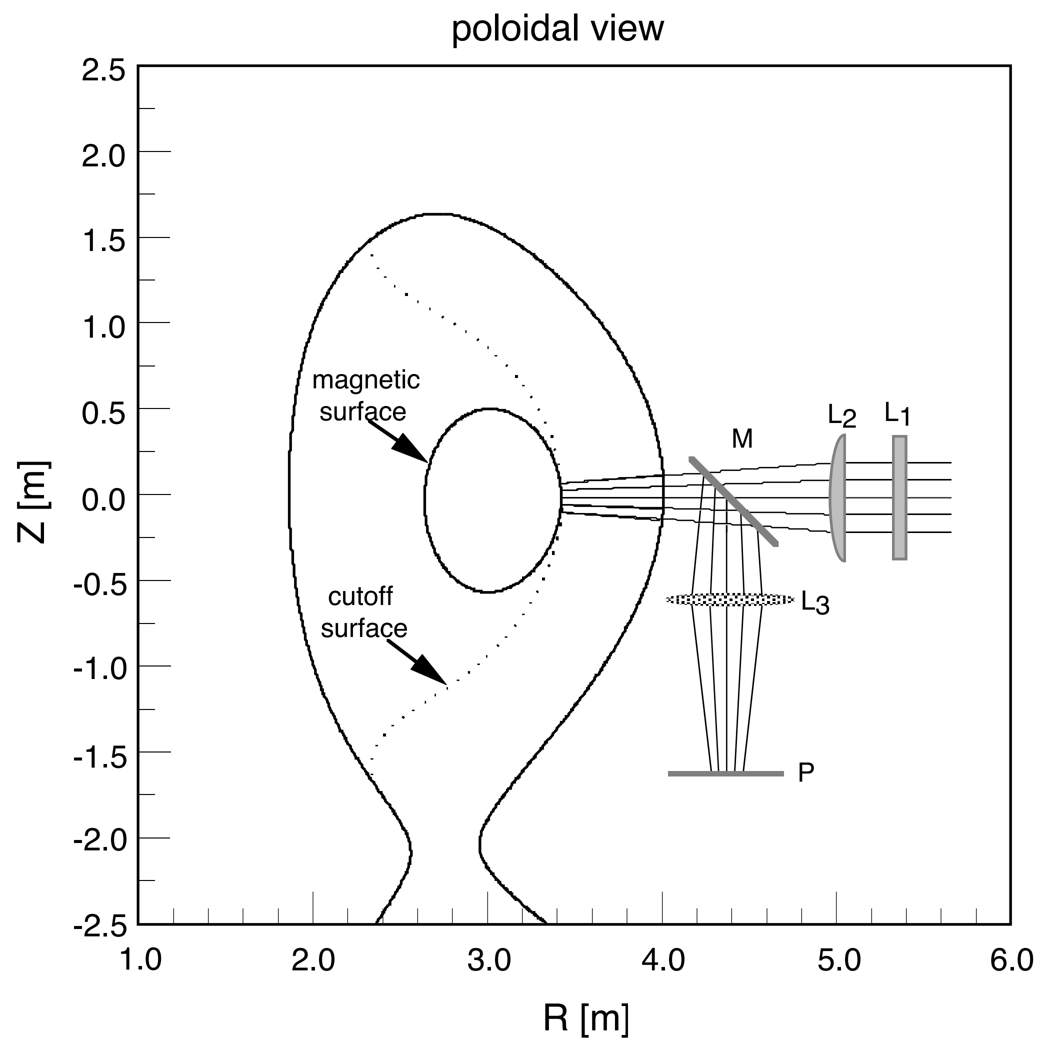

O1
ω_1
active
multiplier
x n
$\omega_0+\omega_1$
BPF
M1
O2
ω_2
tunable
oscillator
ω_0
active
multiplier
x n
$\omega_0+\omega_2$
BPF
M2
O3
ω_3
active
multiplier
x n
$\omega_0+\omega_3$
BPF
M3

Fig. 21



Proof-of-Principle Experiment
Measured Differential Phase
(a)
fringes
frequency (GHz)
0
1
2
3
4
5
90
95
100
105
110
115
120
A
B
C
D
Reconstructed Density Profile
(b)
1019 m-3
0
1
2
3
4
3.2
3.3
3.4
3.5
3.6
A
B
C
D
R0+a
R0+a
R0+a
R0+a
R (m)

Fig. 22



poloidal view
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
Z [m]
1.0
2.0
3.0
4.0
5.0
6.0
R [m]
magnetic surface
cutoff surface
M
L2
L1
L3
P

Fig. 23