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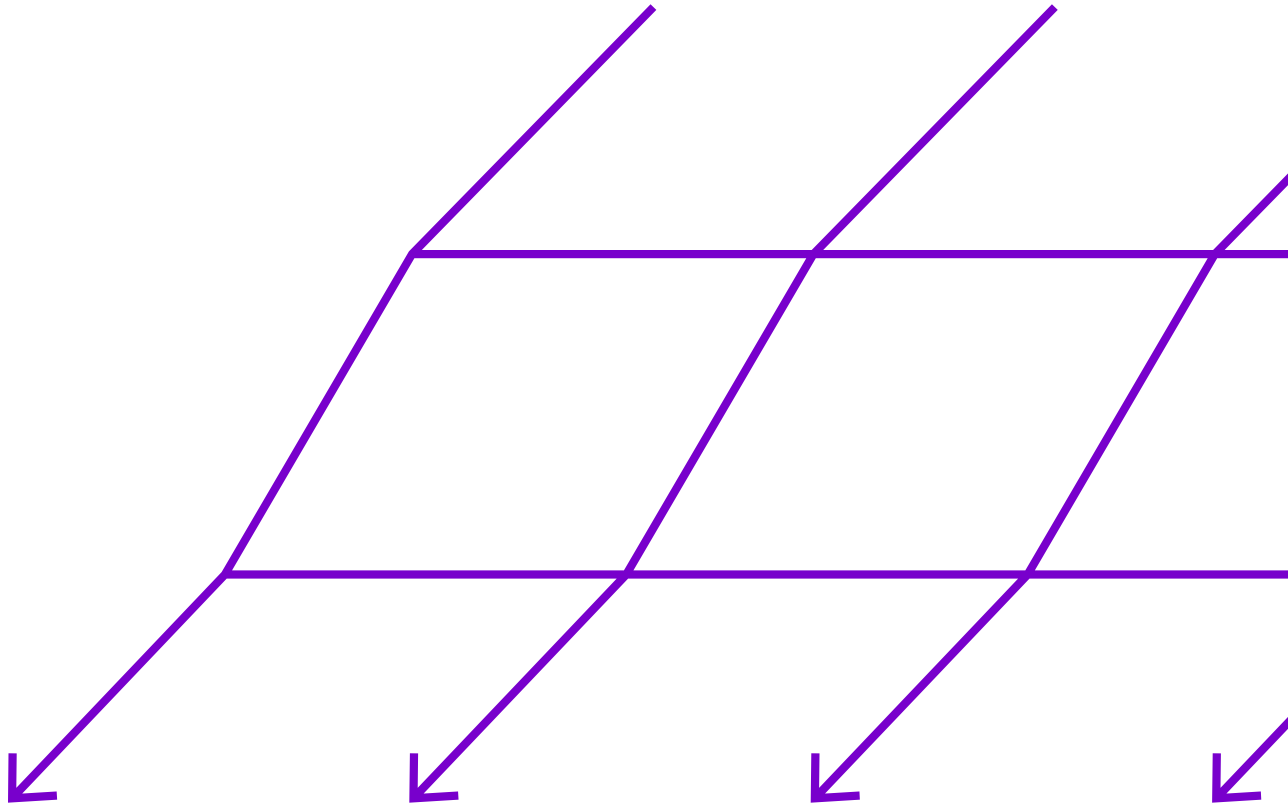
Technical Groups

Optical Rabi Antenna

Featuring Preecha Yupapin, Institute of Vocational Education

14 February 2022



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- Optical Communication Technologies for 5G Wireless Access Networks Webinar
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Today’s Speaker

Preecha Yupapin

Institute of Vocational Education

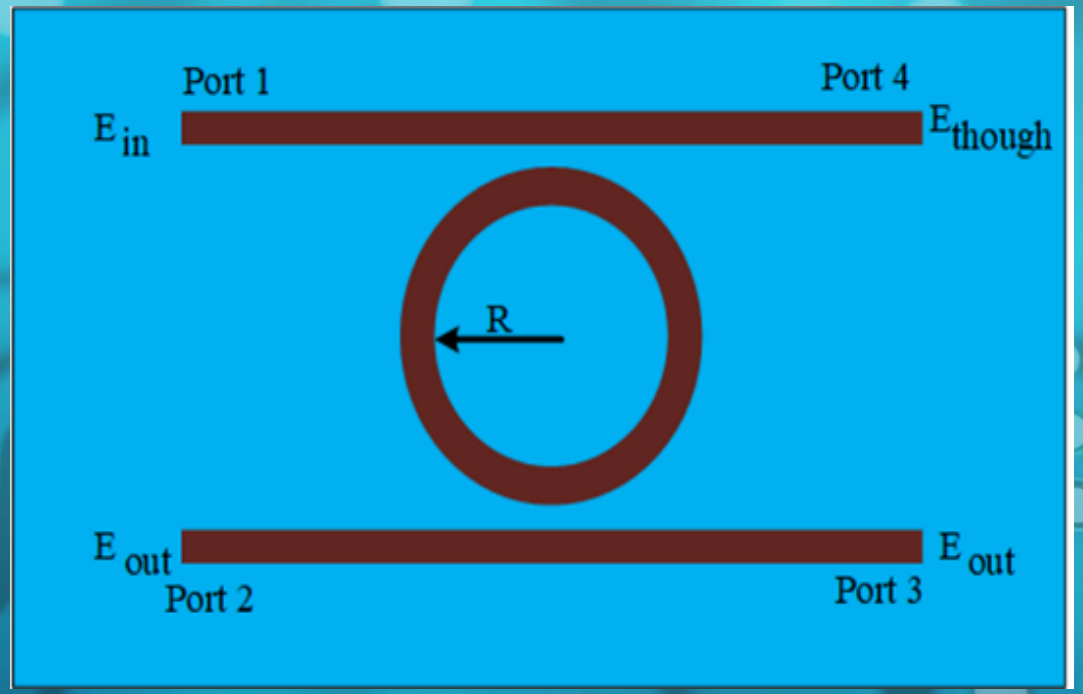
Dr. Preecha P. Yupapin received his B.Ed. in Physics, M.Sc. in Applied Mathematics, PhD in Electrical Engineering from Srinakarinwirote University, Mahidol University and City University of London in 1981, 1983 and 1993 respectively. He was a postdoctoral research fellowship in 1994 under the European Community research project. He has been appointed as a visiting professor at University Technology Malaysia since 2007. He is presently a Professor with the Department of Electrical Technology, School of Industrial Technology, Sakonnakhon, Thailand. He has authored/co-authored more than 675 published papers in SCOPUS database and 30 chapters and books. He has supervised 100 PhD Students and candidates in both local and international universities. Professor Yupapin is a member of Thai Institute Physics (TIP), SPIE, Optica, and was a president of the Optica-Thailand Chapter from 2002-2004. His research interests are in nanophysics; nano-energy, quantum technology, and optical black hole.

OPTICAL RABI ANTENNA

PROF. DR. PREECHA YUPAPIN

INSTITUTE OF VOCATIONAL EDUCATION NORTHEASTERN REGION 2, SAKONNAKHON, THAILAND

OPTICAL RABI ANTENNA



- What is a Rabi antenna?
- What are the Rabi antenna requirements?
- What is a Rabi antenna structure?
- What are the Rabi antenna characteristics?

HOW TO TEST THE WAVE-PARTICLE DUALITY ASPECT? WHAT IS THE ELECTROMAGNETIC WAVE PROPAGATION ALONG A CIRCULAR WAVEGUIDE?

- The particle linear velocity ($\boldsymbol{v}$) along the circle path is given by $\boldsymbol{v = \omega r}$; where $\boldsymbol{\omega}$ is the angular velocity(frequency); $\boldsymbol{r}$ is the circle(ring) radius.
- The projection of particles along the circular path is formed by the harmonic motion, which presents the wave-particle duality.
- The lowest harmonic is the two-level system known as simple harmonic motion, which is Rabi oscillation.
- The relationship of the Rabi oscillation within a ring waveguide is then given by $\boldsymbol{v = \omega r}$.
- Using the speed of light in vacuum $\boldsymbol{c}(\boldsymbol{3x10^8 ms^{-1}})$, then $\boldsymbol{c = 2\pi n f r}$; where $\boldsymbol{n}$ is the waveguide refractive index, $\boldsymbol{f}$ is the linear frequency.

ANSWERS

What is a Rabi antenna?

Two-level system antenna using wave-particle duality of electromagnetic wave moving along a circular path

What are the requirements?

[1]-Two-level system

[2]-Successive Filtering AC signals

What is a Rabi antenna structure?

Add-drop multiplexer

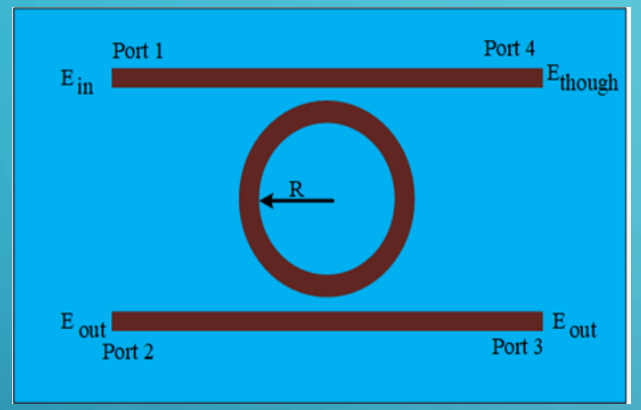
What are the Rabi antenna characteristics?

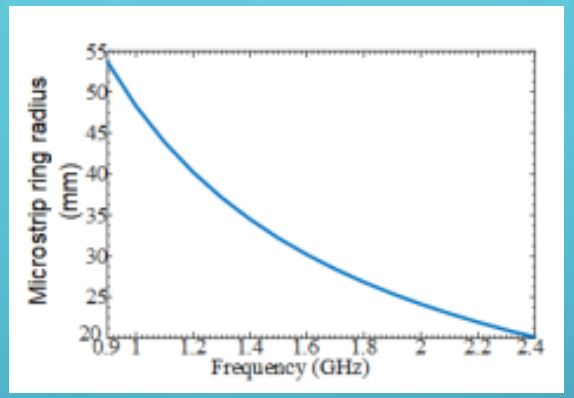
Second harmonic oscillation

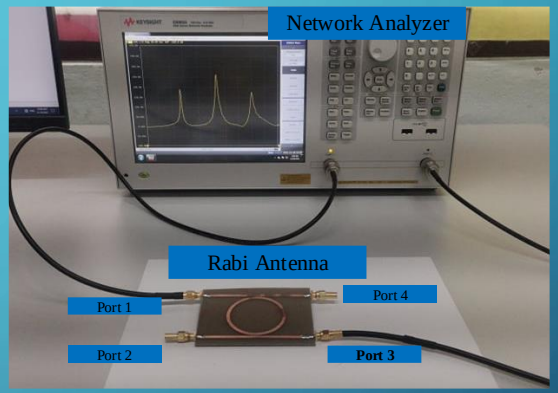
(CONT.)

- To keep the particle motion with a speed of light, the ring radius and the driven frequency source are the basic relationship, where the waveguide material refractive index and ring radius are given to match with the driven frequency.
- In practice, the ring radius can be made suitable for the given frequency, which can be nm, mm, cm, m, km, etc. Therefore, the wave-particle duality can be formed within a large two-level system. The wave-particle aspect doesn’t mean a small system, which leads a new aspect of quantum physics that do not depend on size.
- Using the microstrip, the ring radius is within the range of 30-50 mm, which is easily to prepare and test in the laboratory.

PLOTS OF THE RING RADIUS AND FREQUENCY OF THE MICROSTRIP RING RADIUS







- The two-level system is confirmed. The Rabi oscillation of the particles move along the circle is observed, where the upper side and lower side band associated with the center frequency are observed.
- Which means that if the same material is applied, then $\boldsymbol{v = 2\pi nfr}$.

  [1]- $\boldsymbol{v > c}$; if $\boldsymbol{f}$ is increased with a constant $\boldsymbol{r}$.

  [2]- $\boldsymbol{v > c}$; if $\boldsymbol{r}$ is decreased with a constant $\boldsymbol{f}$.

SUCCESSIVE FILTERING

- Input signal is an AC source; A exp-[$2\pi f t$]
- But in this case, the ring radius is constant, the oscillation frequency is increased by the successive filtering. The speed of particle faster than light can be obtained, which is given by ***Warp speed***= $\frac{v_{Succ}}{c}$; where $\boldsymbol{n}$ and $\boldsymbol{r}$ are fixed, f is the center Rabi frequency(plasma frequency) of each observation; n of the FR4 (Copper) is 3.41.
- The successive filtering can be applied until the two-level system is collapsed and oscillated under the quantum field effects.
- To increase the coupling oscillation force of the wave propagation along the ring radius, more ring circuits can be applied to form the multiband Rabi oscillations.

WARP SPEED CALCULATION

- Using the successive filtering; the particle(wave) oscillates on the edges of the entangled pair of the two-level system (Rabi oscillation), yields
- $\boldsymbol{v = \omega r = 2\pi f r}$**; where** $\boldsymbol{v = \frac{c}{n}}$**;**
- [1] $v = c$; oscillates overlap the ground and excited states
- [2] $v < c$; oscillates outside the ground and excited states
- [3] $v > c$; oscillates inside the ground and excited states

WARP SPEED CONT.

- Using the successive filtering; the particle(wave) oscillates on the edges of the entangled pair of the two-level system (Rabi oscillation), yields
- $\boldsymbol{v = \omega r = 2\pi f r}$**; where** $\boldsymbol{v = \frac{c}{n}}$**;**

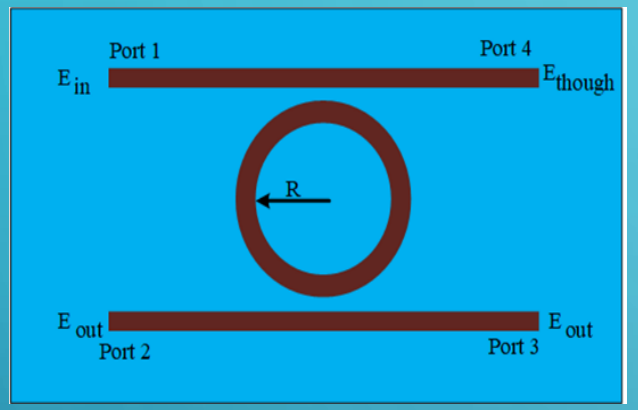
After the successive filtering, the resonant output signal;

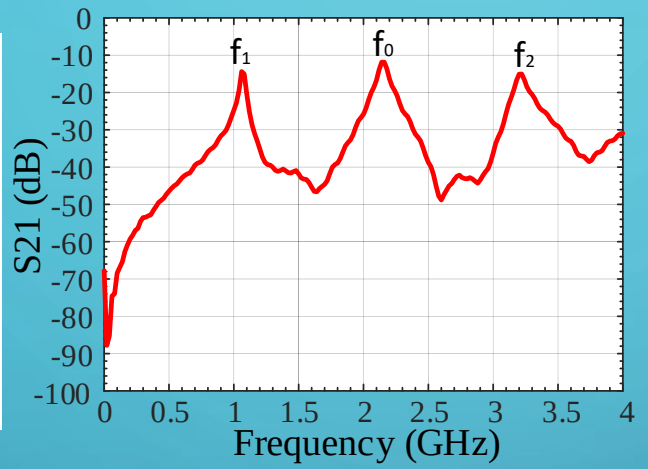
$\boldsymbol{v = 2\pi f r}$=$2\pi$. [2.10 GHz]. [25mm]=1.1c.

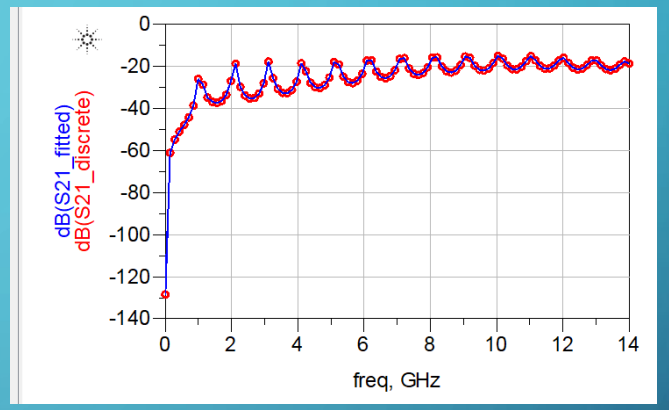
WHAT CAN BE OBSERVED?

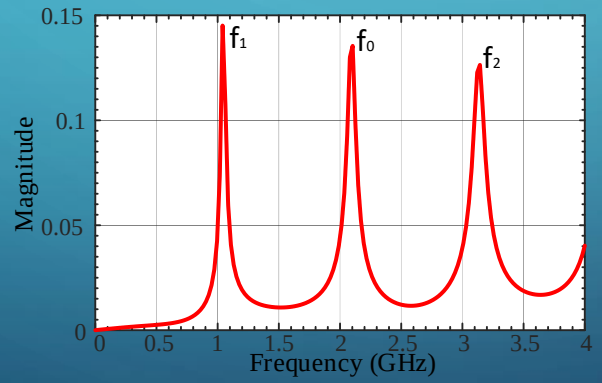
- Electron density and plasma
- Rabi frequency oscillation
- Time dilation
- Plasma force
- Red and Blue shifts

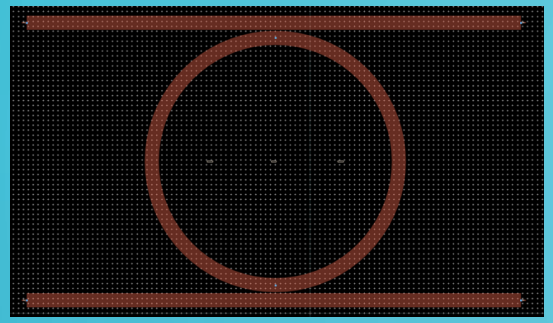
EXPERIMENTAL RESULTS

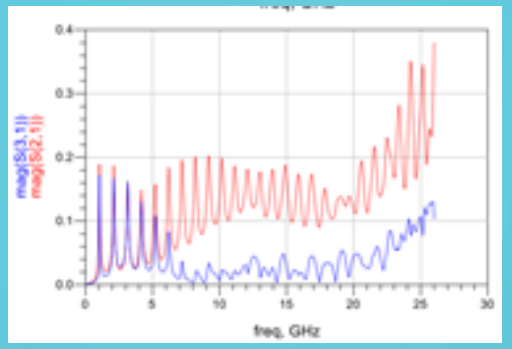








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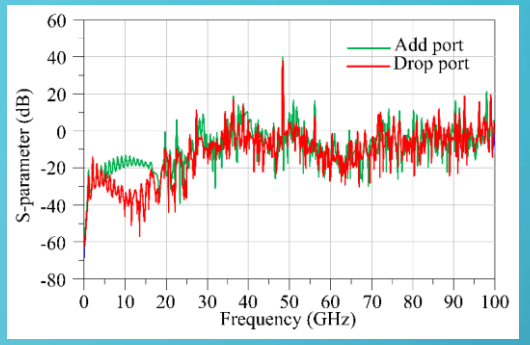
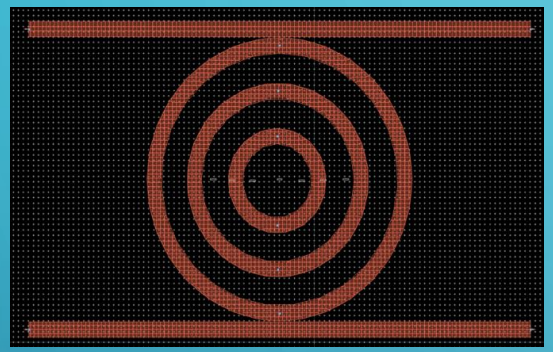
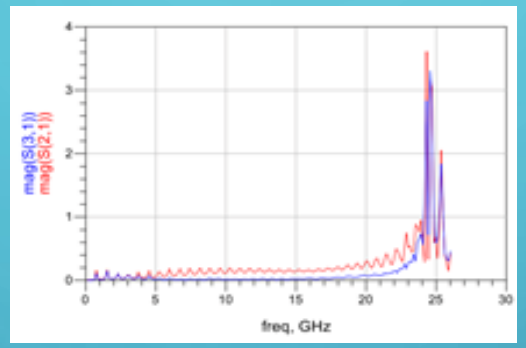
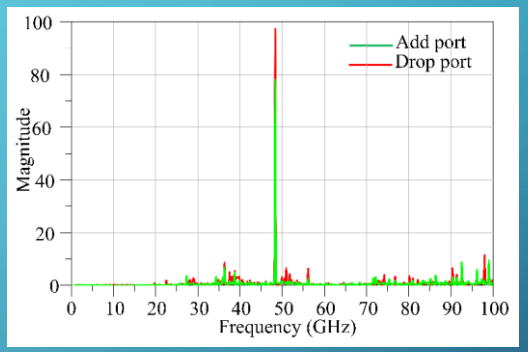
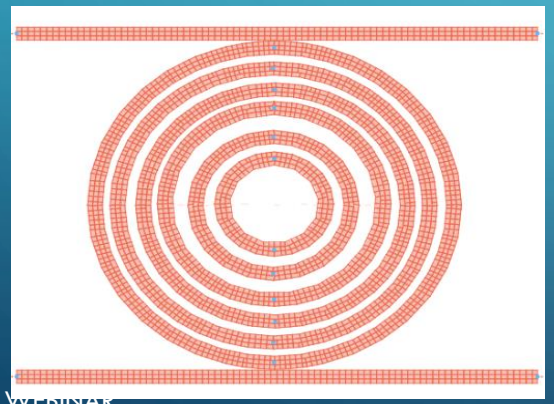
mag(S(2,1))
freq, GHz

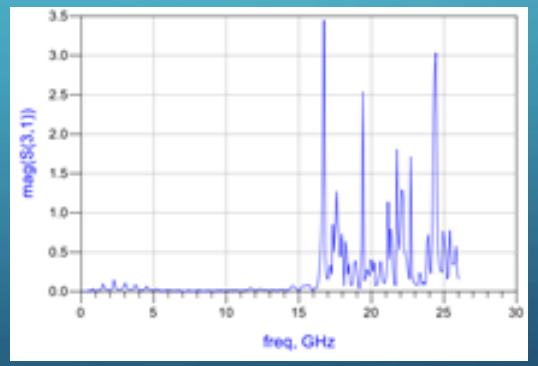

Add port
Drop port
S-parameter (dB)
Frequency (GHz)

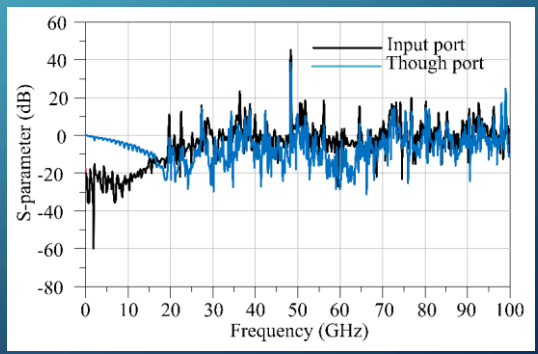


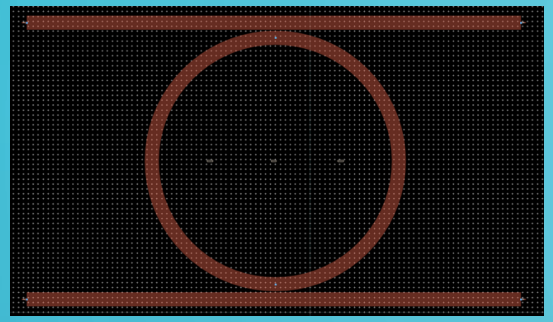

mag(S(3,1))
mag(S(2,1))
freq, GHz

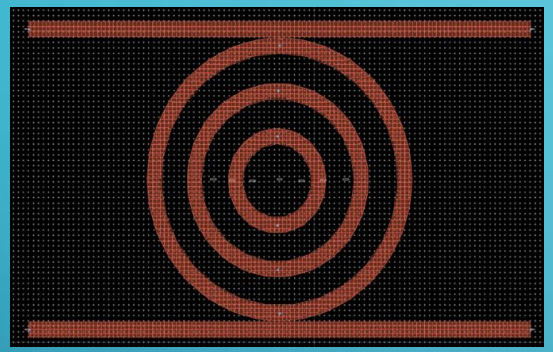

Add port
Drop port
Magnitude
Frequency (GHz)

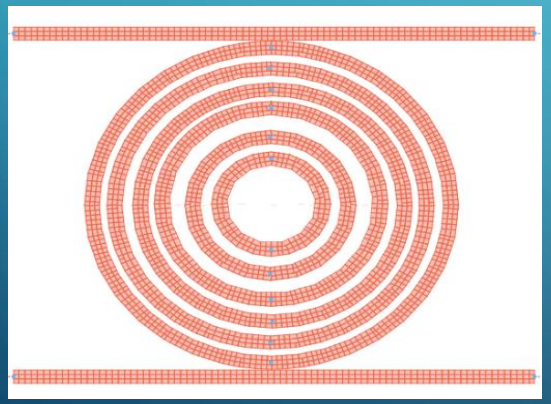


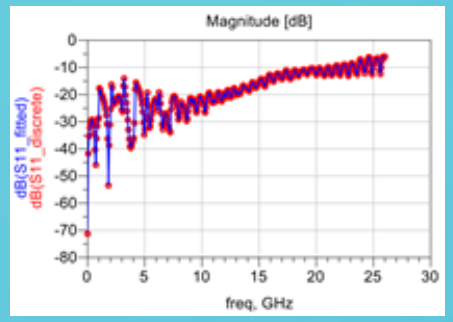

mag(S(3,1))
freq, GHz

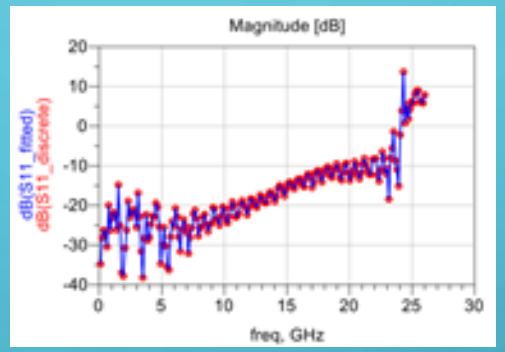

Input port
Though port
S-parameter (dB)
Frequency (GHz)

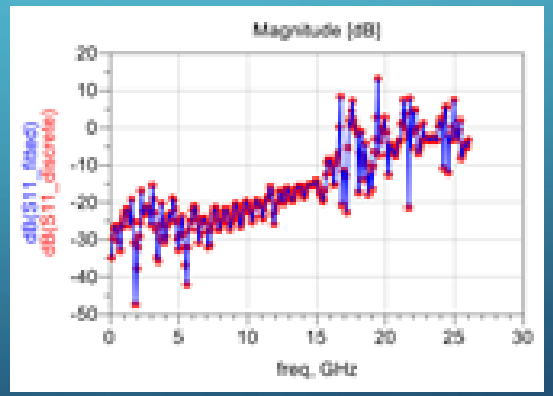


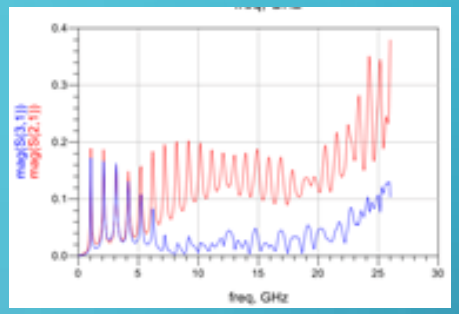


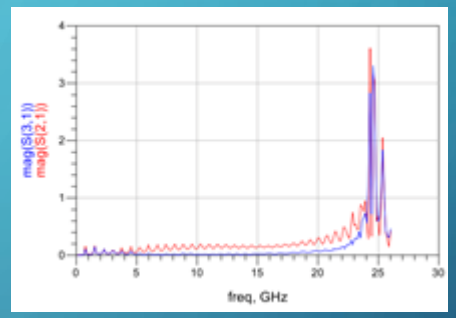


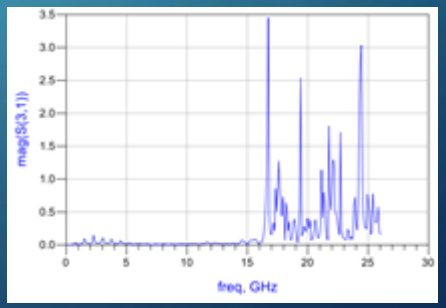

Magnitude [dB]
dB(S11_fitted)
dB(S11_discrete)
freq, GHz


Magnitude [dB]
dB(S11_fitted)
dB(S11_discrete)
freq, GHz


Magnitude [dB]
dB(S11_fitted)
dB(S11_discrete)
freq, GHz


mag(S(3,1))
mag(S(2,1))
freq, GHz


mag(S(3,1))
mag(S(2,1))
freq, GHz


mag(S(3,1))
freq, GHz

THE COUPLING EFFECT WITHIN THE GROUND AND EXCITED STATES

- The coupling of particles on the circle radial in one dimension with 2 sides of time leads to have the relationships as

  [1]- $\Delta \boldsymbol{x} \Delta \boldsymbol{p} \sim \frac{\boldsymbol{h}}{\boldsymbol{2\pi}}$;

  [2]- $\Delta \boldsymbol{E} \Delta \boldsymbol{t} \sim \frac{\boldsymbol{h}}{\boldsymbol{2\pi}}$;

- Where the weak, electromagnetic and strong couplings can be occurred with the coupling forces of $\mathbf{10^{24}}$mg, $\mathbf{10^{37}}$mg and $\mathbf{10^{39}}$mg, respectively. These forces can be used for driven forces (propulsive forces).

THE APPLICATIONS OF THESE DEVICES

Quantum gates	Uses the entangle photons (electron spins)
Hall effect sensors	Electric field projection
Zeman effect sensors	Electron spin splitting
Warp speed flip-flop	Warp speed electron spin control
Warp drive	Coupling force control; $\boldsymbol{\omega_p = \sqrt{\frac{n_e e^2}{\varepsilon_0 m}}}$; where $\boldsymbol{\omega_p}$ is the electron plasma frequency (Rabi frequency); Force = $-m\omega^2 r$
Superconductor	Warp speed electron spin control
Thermo electric effect sensors	$\boldsymbol{\sum_{i=1}^{n} 2\pi^2 r m_i f_i^{\,2} = N k_B (T_f - T_i)}$; It is introduced at the center circuit

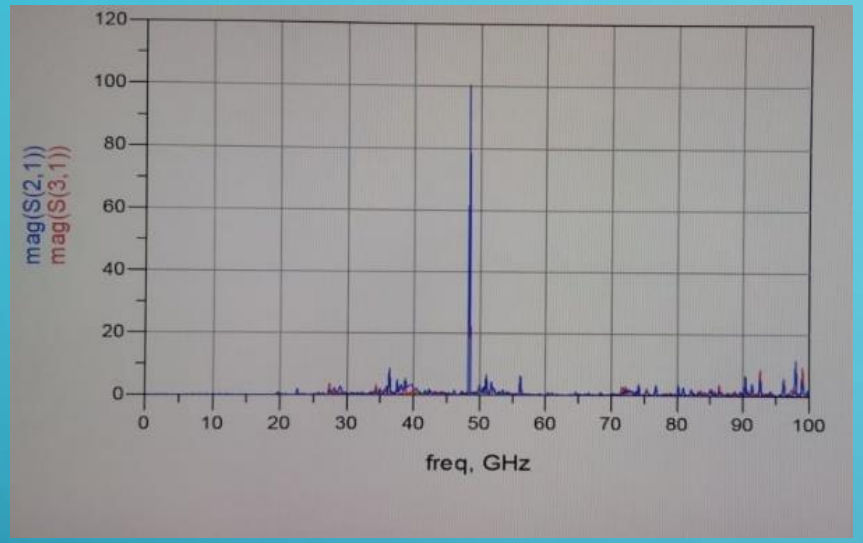
APPLICATIONS

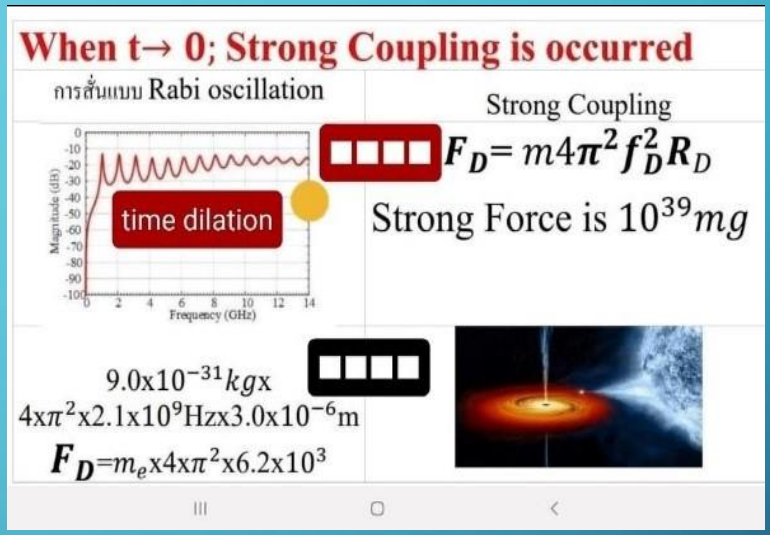
Hibernation environment	The stopping condition when $\sum_{i=1}^{n} 2\pi^2 r m_i {f_i}^2 = N k_B (T_f - T_i) = 0$
Warp speed torque	$\boldsymbol{Torque}$=rxF= m$\omega^2 r^2$
Magnetic monopole and levitation force	$\boldsymbol{F_{mag}}$=qvxB=q$\omega r B$
Teleportation	Warp speed transport from one side of time to other side with the same information
Bose-Einstein State	?
Strange particles	Strange particles can be formed by the strong coupling

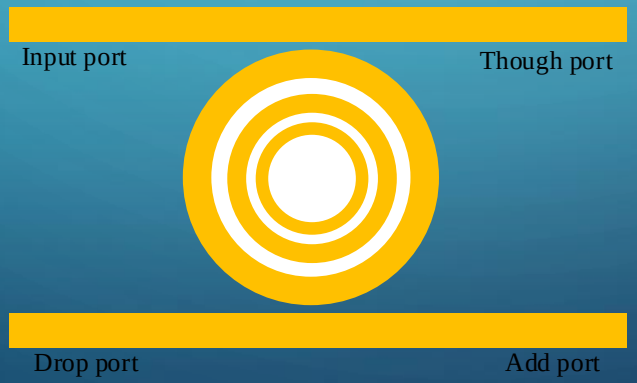
CONT.

White and Black Holes	Requires high capacity computer; Advanced instrument
High speed quantum communications	Spin-wave transmission
Quantum consciousness	Using Rabi antenna for quantum consciousness sensors probe
High speed 3D imaging construction and display	Use electron spins to process x, y, z projection and printing applications
Time crystal	Use time dilation within a Rabi gap generate time crystal and time machine
Warp speed sensors	Warp speed aircraft detection and monitoring

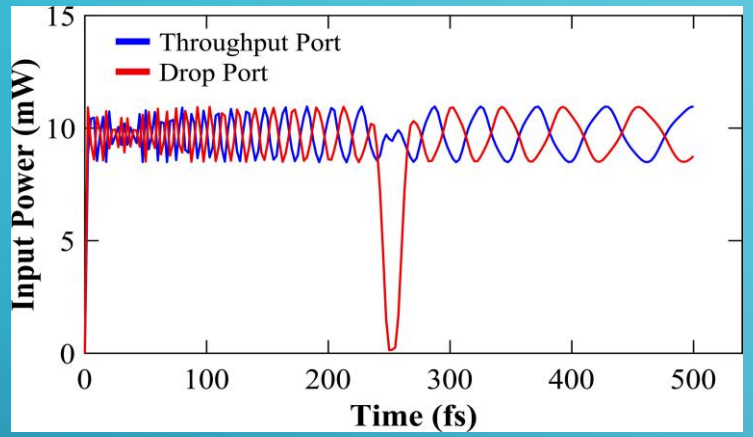
THE STRONG COUPLING POWER

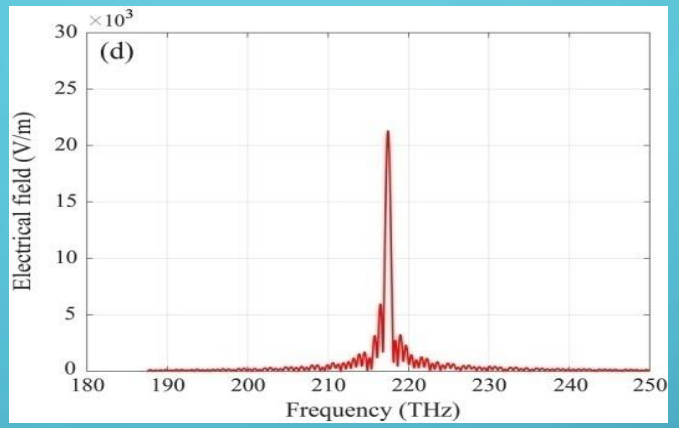


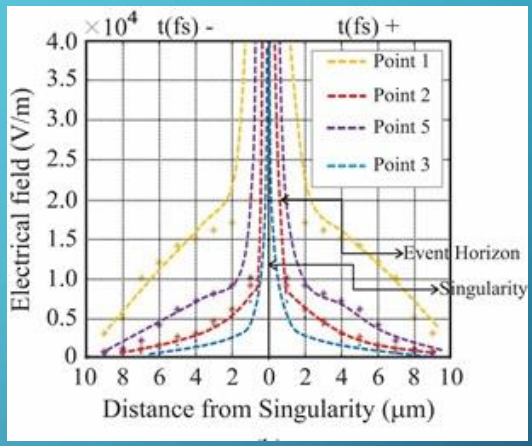




BLACK HOLE & SINGULARITY







TIME DILATION

- $T = \frac{T_0}{\sqrt{1-\frac{v^2}{c^2}}}$; when $v < c$
- $T \sim \boldsymbol{T_0}[\mathbf{1} + \frac{\mathbf{1}}{\mathbf{2}}\frac{\boldsymbol{v^2}}{\boldsymbol{c^2}}]$; when $v > c$

Uses $[\mathbf{1} - \frac{\boldsymbol{v^2}}{\boldsymbol{c^2}}]^{\boldsymbol{-1/2}}$ expansion

- The time dilation can be obtained when the warp speed is formed by the successive filtering of the Rabi antenna.

POTENTIAL INVESTIGATION

Using Variable Function Generator	Broadband frequency range and input power; New waveguide material; larger ring radius
Broadband spectrum analyzer	
Broadband signal synthesizer	
Investigations	Quantum Relativity; Quantum Fields, Quantum Electrodynamics; Quantum Chromodynamics; Quantum Statistics; Quantum Gravity
Applications	Warp drive; Hibernation system; Time dilations; Quantum technology

QUESTIONS AND ANSWERS

THANKS FOR LISTENING