Gravitational Field Propulsion Techniques

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Presentation Outline

Classical approaches using General Relativity (GR) covered:

- Forward Coil Mass Flow Toroids (GRFC)
- Tokamak Plasma Quadrupole Oscillators (GRPQ)
- EM wave to GW Conversion in Static EM Fields (GREM)
- Classical GR Warp Drives (GRWD)
- Classical GR Worm Holes (GRWH)
- Classical GR Tractor Beams (GRTB)

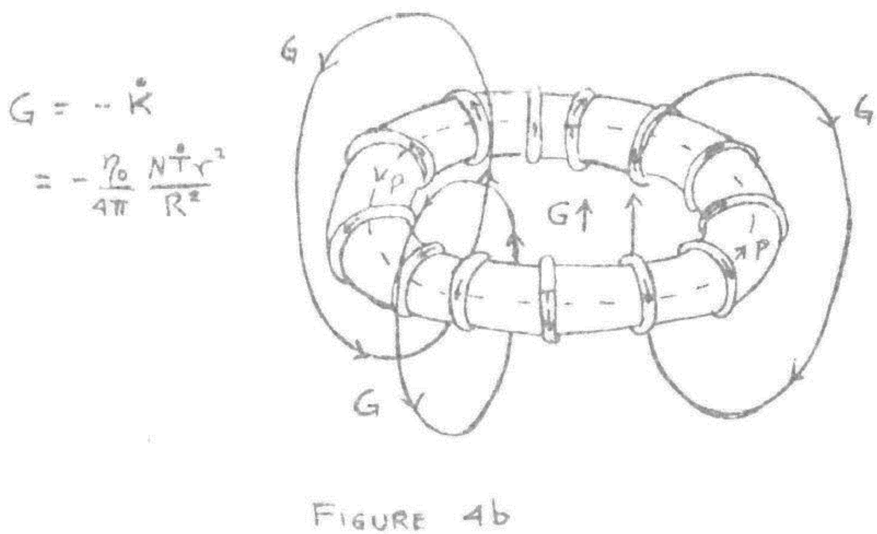
Quantum Mechanical (QM) approaches covered:

- The direct stimulation of graviton emission (QMGE)
- The stimulation of spacetime metamaterials (QMMM)
- Quantum mechanically triggered teleportation (QMTP)

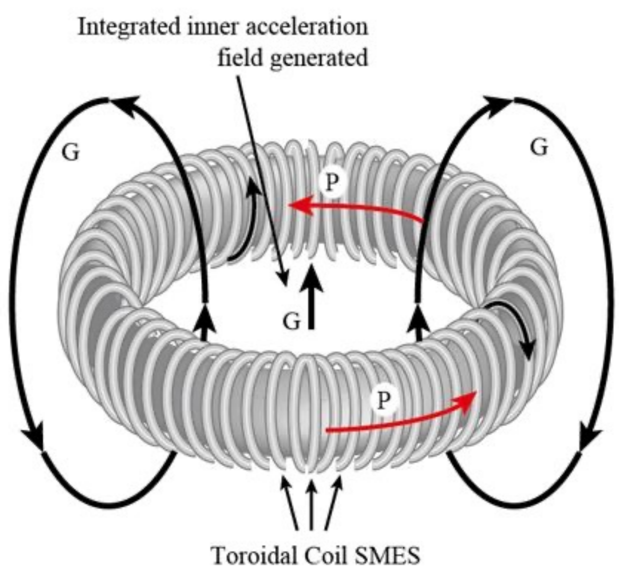
A taxonomy of field propulsion techniques is proposed

Forward Coil (GRFC)

- A mass flow toroid, first conceived of by Robert Forward
- Concentrates gravitomagnetic acceleration field in the center of the coil
- References: 1962 Forward, 2019 & 2021 Stephenson (at MG 15 & 16)



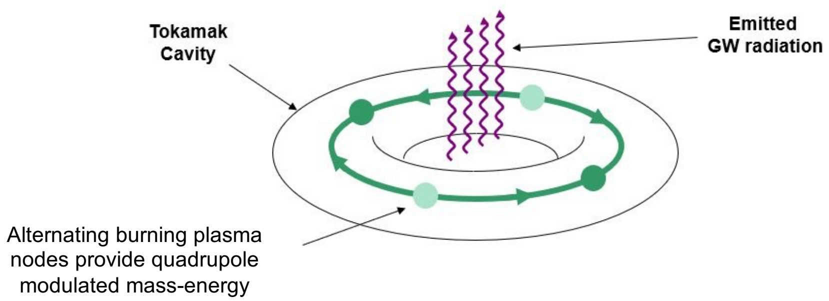
1962 Forward, fig. 4b



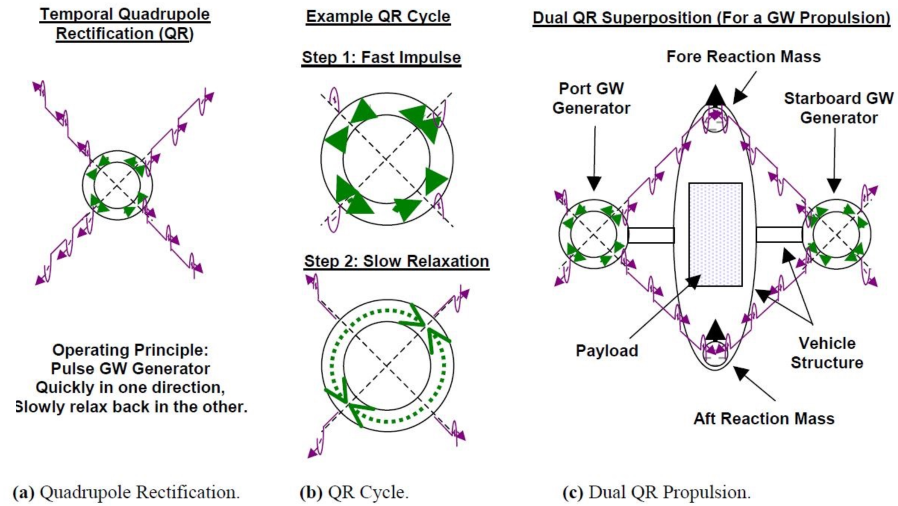
2019 Stephenson, fig. 1

Tokamak Plasma Quadrupole Flow (GRPQ)

- A Tokamak plasma quadrupole oscillator would create gravitational waves (GW), which could then be rectified via quadrupole rectification
- Examples:
  - 1975 Grishchuk and Sazhin - EM Standing wave in tokamak
  - 2003 Stephenson – quadrupole plasma flow in tokamak
  - 2017 Stephenson – burning plasma in quadrupole pattern in tokamak



2017 Stephenson, burning plasma quadrupole



2005 Stephenson, quadrupole rectification

Classical EM wave to GW Conversion in Static EM Fields (GREM)

- An EM wave traveling through a static EM field can create a GW
- Quadrupole rectification or Christodoulou effect to obtain DC gravity
  - 1962 Gertsenshtein – EM to GW in static B field
  - 1970 Boccaletti – EM to GW in static E or B field

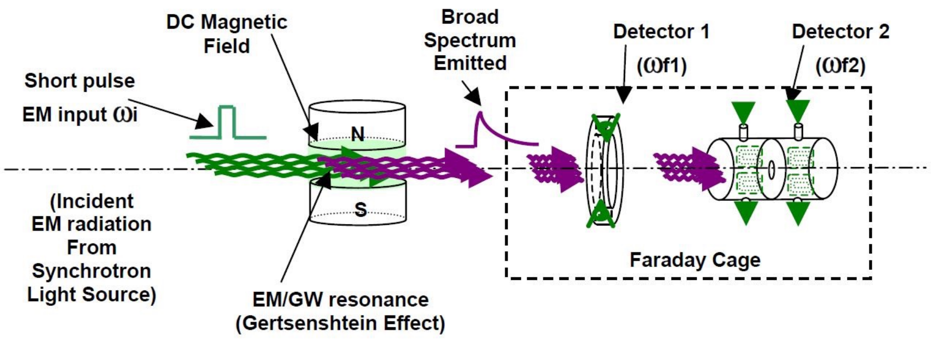


FIGURE 4. Short Pulse Demo Option.

2005 Stephenson, fig 4, short pulse demo

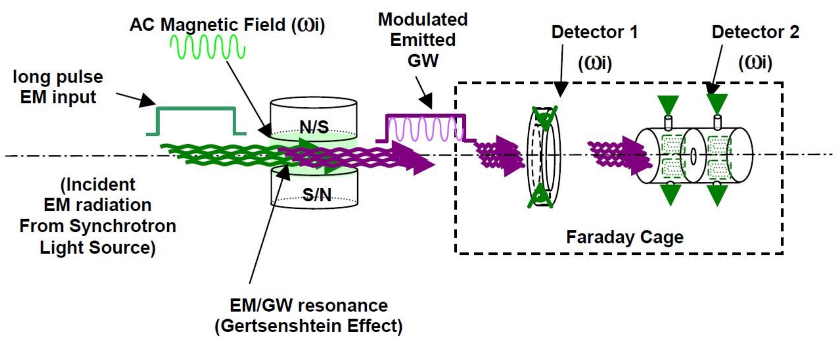
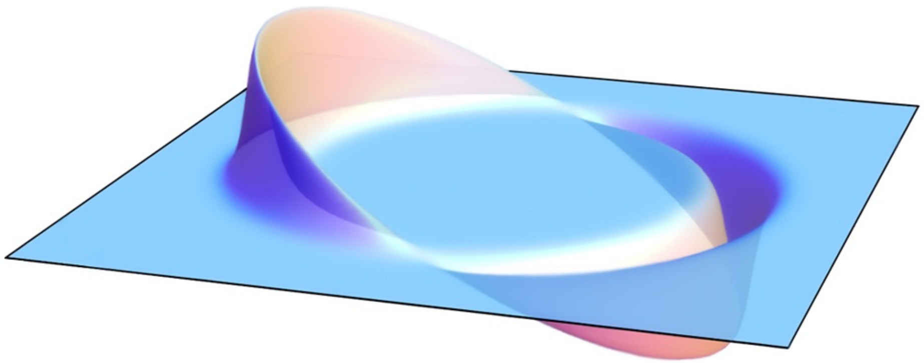


FIGURE 5. Long Pulse Demo Option.

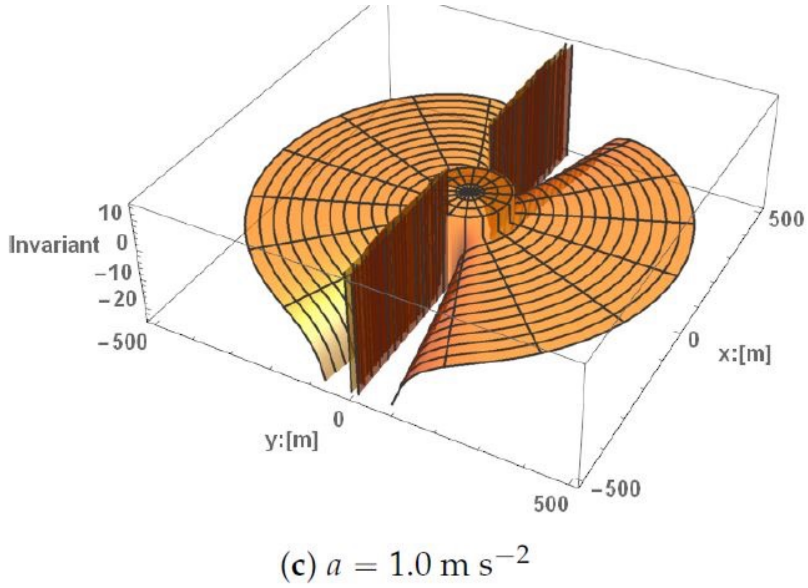
2005 Stephenson, fig 5, long pulse demo

Classical General Relativity Warp Drives (GRWD)

- Warp drive solutions to Einstein's GR field equations are evolving rapidly
  - 1994 Alcubierre – original warp drive solution
  - 1998 Krasnikov – non-tachyonic warp bubble
  - 1999 Van Den Broek – warp drives with reasonable energy reqts
  - 2002 Natario – Alcubierre without expansion or contraction
  - 2018 Loup – 6 different Natario metrics; includes global acceleration cases
  - 2020 Mattingly – Natario acceleration cases
  - 2020 Lenz - Breaking the Warp Barrier
  - 2022 Carneiro – Alcubierre using TEGR
  - See also: https://appliedphysics.org/warp-factory/



The Alcubierre War Drive solution
Credit: https://en.wikipedia.org/wiki/Alcubierre_drive

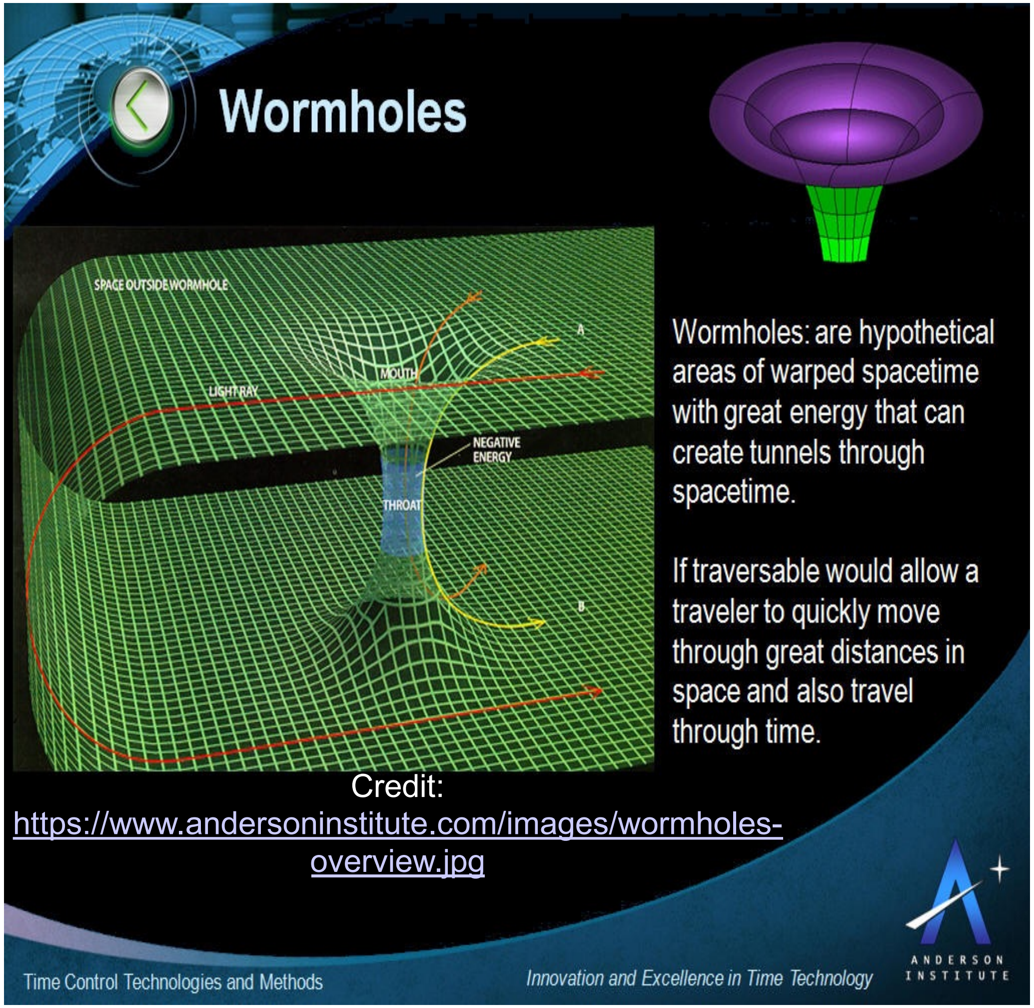


2020 Mattingly, fig 2c, Natario warp, with acceleration

Classical General Relativity Worm Holes (GRWH)

Wormhole solutions are also rapidly evolving:

- 1988 Morris & Thorne – original worm hole solution
- 1995 Visser – Lorentzian Wormholes
- 1998 Davis – Wormhole Induction Propulsion
- 2017 Loup – Wormhole Basics
- 2020 Maldacena – Traversable wormholes in 4D

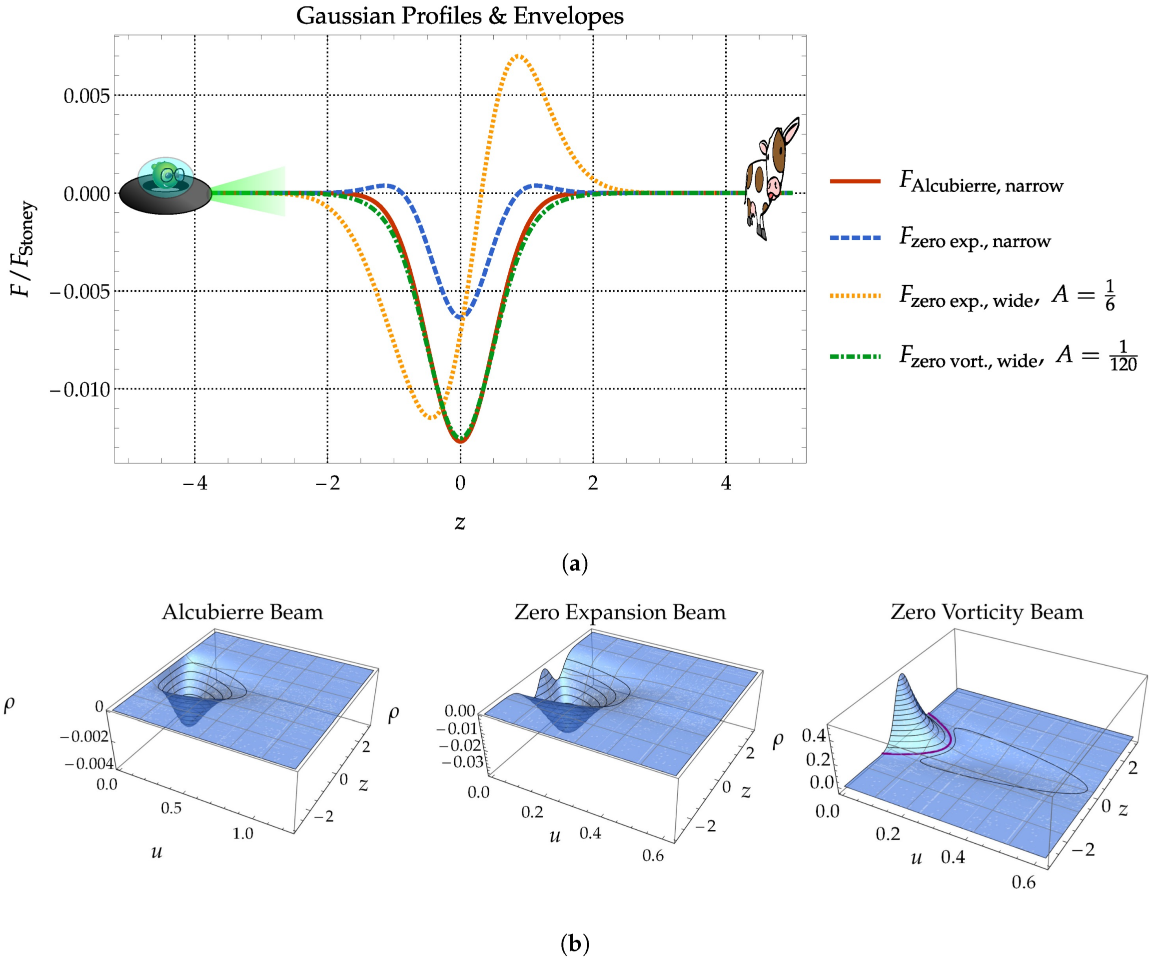


Credit: https://www.andersoninstitute.com/images/wormholes-overview.jpg

Classical General Relativity Tractor Beams (GRTB)

- 2021 Santiago, Schuster, & Visser, “Tractor Beams, Pressor Beams and Stressor Beams in General Relativity” https://www.mdpi.com/2218-1997/7/8/271

Figure 1. (**a**) Forces F and (**b**) energy densities ρ for Gaussian beam profiles. The field is assumed to be sourced by someone on the left at negative z, the target—a flat cow in the tractor field space-time—on the right at positive z. Choosing the source and target provides for a distinction between tractor and pressor (or repulsor) fields. Details concerning this particular beam configuration can be found in Section 6.2.1. The parameters of Equation (186) that we have chosen are: $A = 0.5$ and $B = C = 1.0$. The purple line in the density plot for the zero-vorticity beam indicates the location where the energy density is zero.

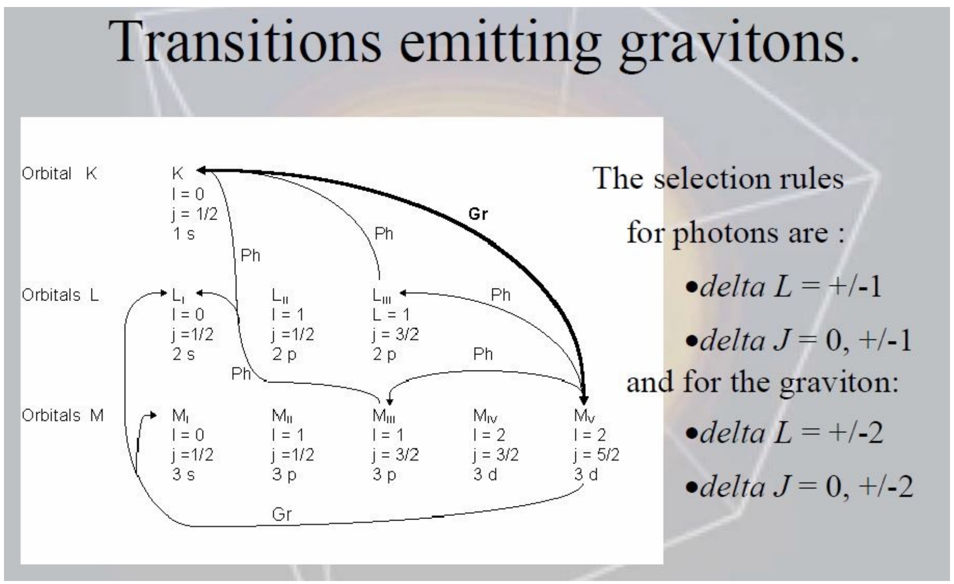


2021 Santiago et al., fig 1

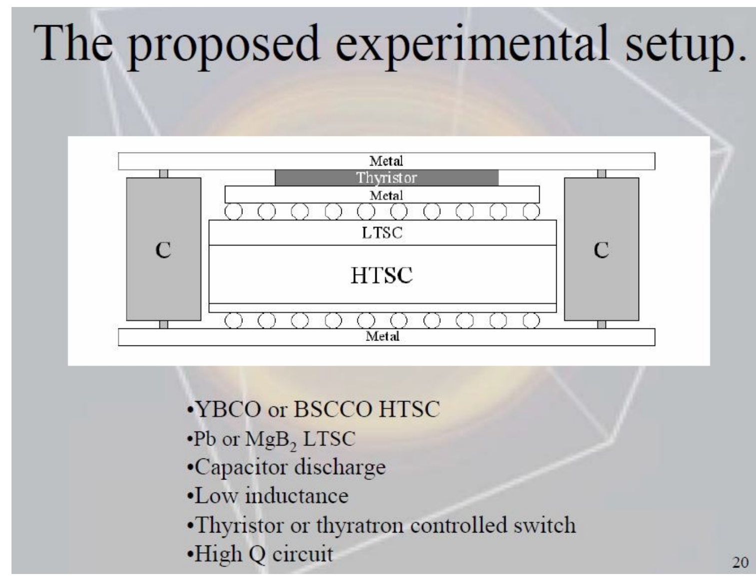
Quantum Stimulated Emission of Gravitons (QMGE)

QMGE Examples:

- 1964 Halpern and Laurent – Quantum transitions leading to gravitons
- 2007, 2018 Fontana – GASER, LTSC/HTSC JJs



2007 Fontana – spin 2 transitions emitting gravitons



2007 Fontana – junction forcing spin 2 transitions

Spacetime Metamaterials (QMMM)

QMMM References:

- 2019 Caloz - Spacetime Metamaterials
- 2021 Sarfatti - 3+1 ADM Warp Drive Inside Metamaterial

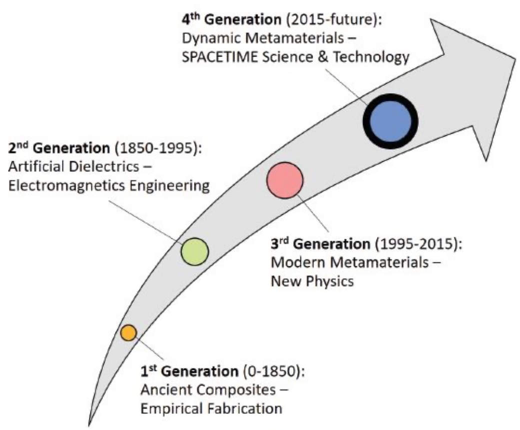


Fig. 1. Metamaterial evolution in four consecutive generations, where the recently started 4th generation is largely represented by spacetime metamaterials.

2019 Caloz fig 1 – MM evolution

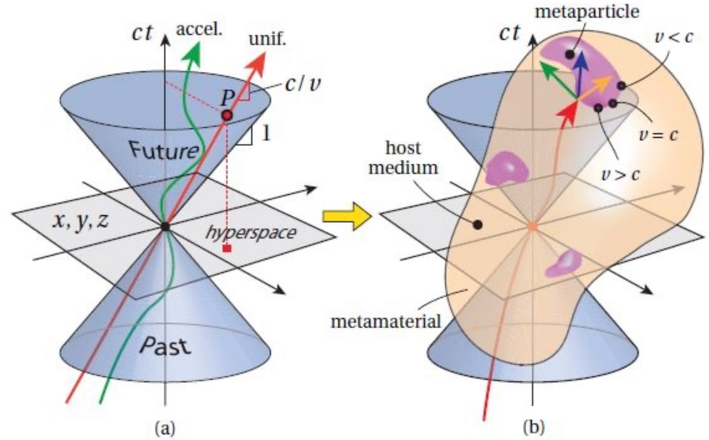
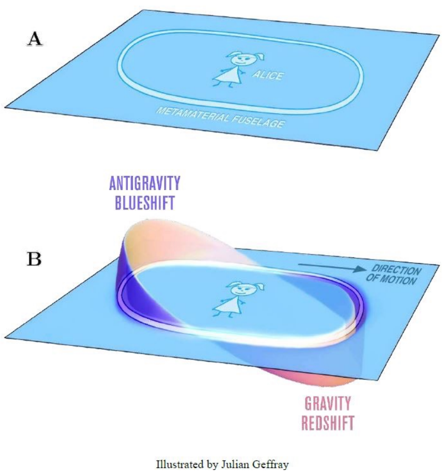


Fig. 5. Spacetime diagrams. (a) Conventional case, with a uniform trajectory (red), an accelerated trajectory (green) and the light cone (blue). (b) Metamaterial extension, including a host medium (brown) and a few metaparticles (magenta) with subluminal ($v < c$), luminal ($v = c$) and superluminal ($v > c$) discontinuity features, here with a subluminal nonuniform (inhomogeneous host medium) wave strongly scattered by one of the spacetime metaparticles.

2019 Caloz fig 5 – light cone with MM



2021 Sarfatti – MM tic tac hull

Quantum Mechanical Teleportation Techniques (QMTP)

- The subcategories adopted here are based on those proposed in 2004 Davis, Teleportation Physics Studies:
  - Vacuum metric engineering for teleportation (QM-vmTP)
  - Quantum entanglement as used for teleportation (QM-qTP)
  - Exotic extra dimensions or parallel universes leveraged for teleportation (QM-eTP)
  - Psychic or telekinetic teleportation (QM-pTP)

Vacuum metric engineering for teleportation (QM-vmTP)

- Quantum vacuum engineering of warp drives or wormholes such as 1989 Morris & Thorne, 1989 & 1995 Visser
- See also:
  - 1990 Scharnhorst
  - 2002 Puthoff
  - 2021 Balytsyki, Hoyer, Pinchuk, Williams

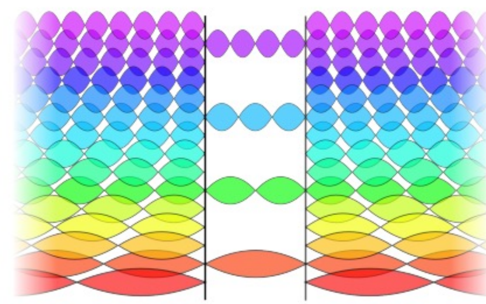
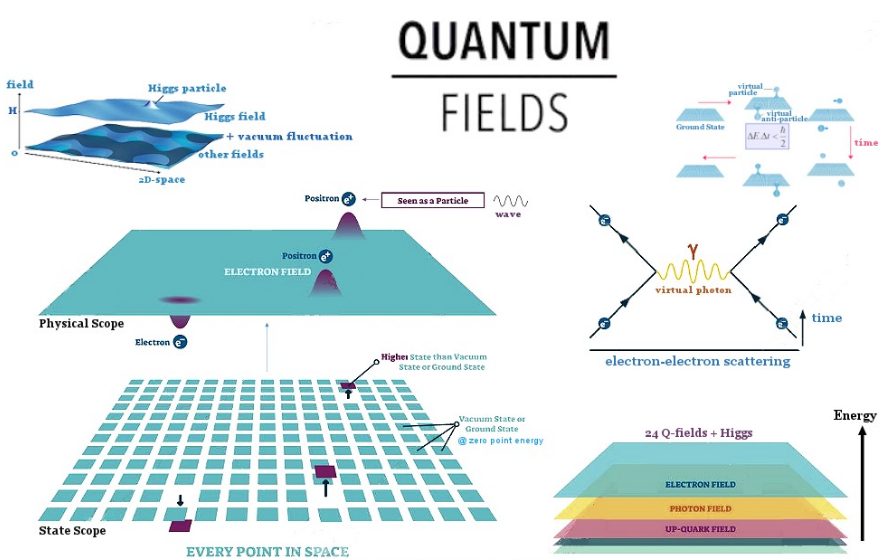


Figure 1: Outside the cavity formed by the plates, all vacuum frequencies are allowed. Within the cavity, however, the vacuum modes take on discrete frequencies. Changing the width of the cavity changes the density of modes relative to free space, which yields an energy difference.

2009 Kingsburg – Casimir Effect,
Two parallel plates suppressing ZPE modes



2-D Quantum Fields

Credit: https://universe-review.ca/R15-12-QFT20.htm

Table 2. Metric Effects in the PV-GR Model When $K < 1$ (Compared With Reference Frames at Asymptotic Infinity Where $K = 1$; adapted from Puthoff et al., 2002)

Variable	**Determining Equation** (subscript 0 is asymptotic value where $K = 1$)	$K < 1$ *(typical mass distribution, M)*
modified speed of light $c^*(K)$	$c^* = c_0/K$	speed of light $> c_0$
modified mass $m(K)$	$m = m_0K^{3/2}$	effective mass decreases
modified frequency $\omega(K)$	$\omega = \omega_0K^{-1/2}$	blueshift toward higher frequencies
modified time interval $\Delta t(K)$	$\Delta t = \Delta t_0K^{1/2}$	clocks run faster
modified energy $E(K)$	$E = E_0K^{-1/2}$	higher energy states
modified length $L(K)$	$L = L_0K^{-1/2}$	objects/rulers expand
dielectric-vacuum "gravitational" forces $F(K)$	$F(K) \propto \nabla K$	repulsive gravitational force

2004 Davis, Table 2, Metric Effects of PV-GR

Quantum entanglement as used for teleportation (QM-qTP)

- Use quantum entanglement to duplicate states, xmit, & 3D print quantum states
- Issue: reading quantum states destroys the states of the original copy
- References
  - 1993 Bennett
  - 2002 Mavromatos
  - 2003 Rarity

Credit: https://www.businessinsider.com/how-teleportation-really-works-physics-2017-11

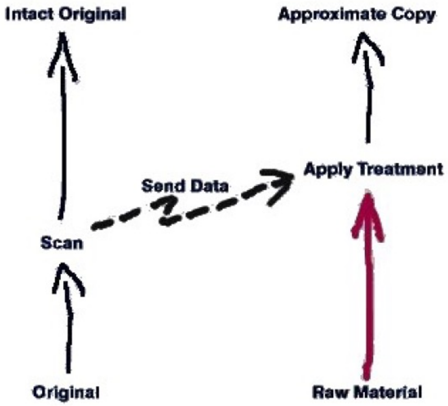


Figure 6. Classical Facsimile Transmission (Modified IBM Press Image)

2004 Davis fig 6, Regular Fax Transmission

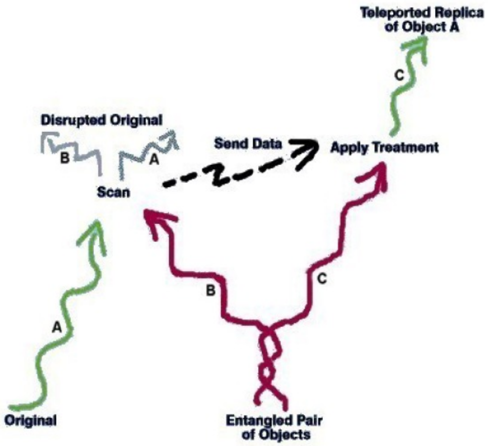
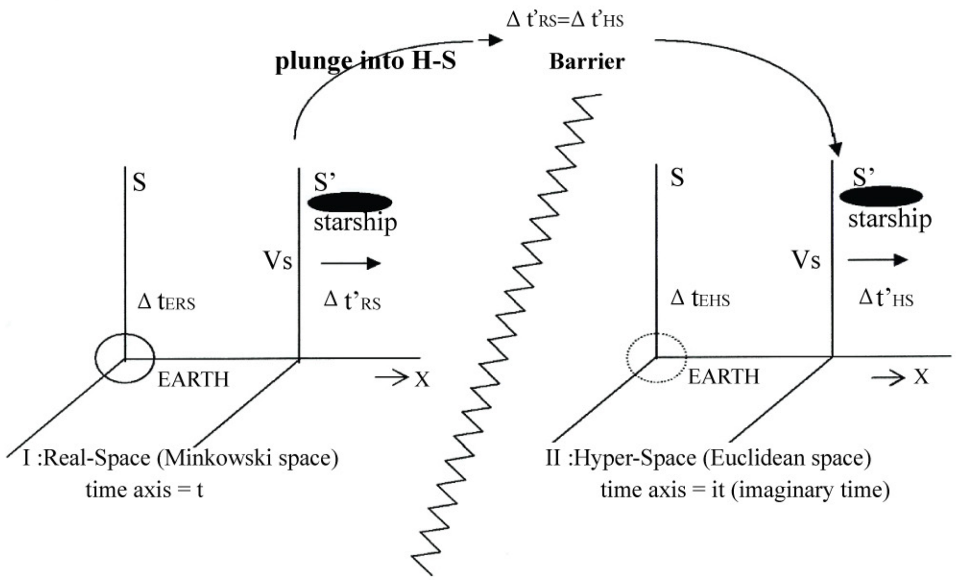


Figure 7. Quantum Teleportation (Modified IBM Press Image)

2004 Davis fig 7, Quantum Teleportation

Exotic extra dimensions or parallel universes leveraged for teleportation (QM-eTP)

- Travel through extra dimensions also known as utilizing ‘hyperspace’
- Predictions of extra dimensions are evolving:
  - 1921, 1926, Kaluza-Klein
  - 1985 Green
  - 1989, 2002 Arkani-Hamed, Dimpoulos, Davli
  - 1999 Randall & Sundrum
  - 2024 Boyd
- The methodology for entering or exiting hyperspace is often TBD



2009 Minami, hyperspace as an imaginary axis

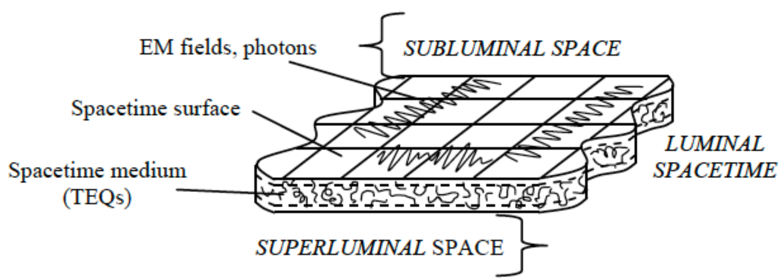


FIGURE 1. A segment of the Tri-Space universe showing subluminal, luminal and superluminal spaces.

2009 Meholic fig 1, Hyperspace as a superluminal layer

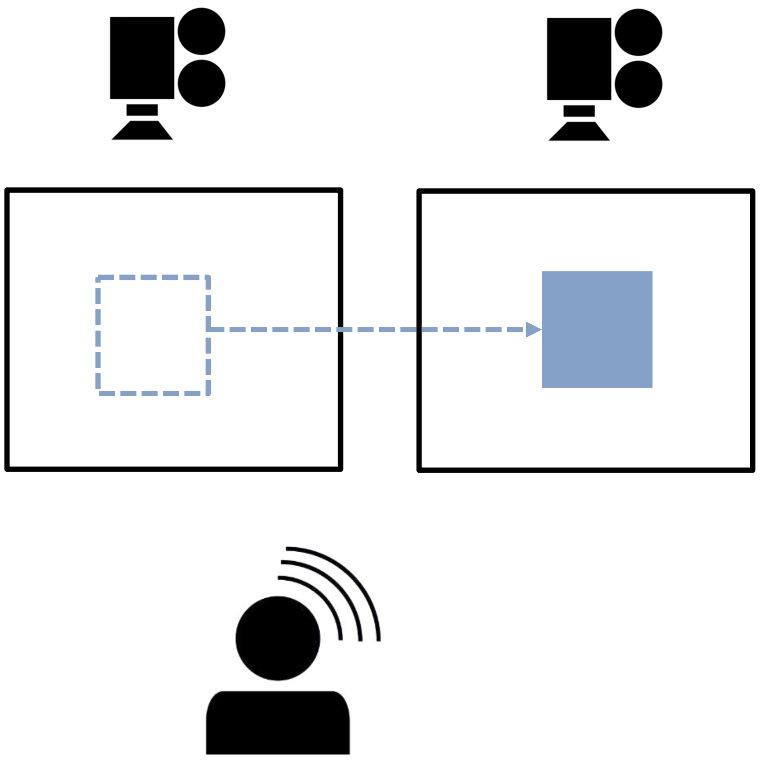
Psychic or telekinetic teleportation (QM-pTP)

Reports of human controlled telekinesis or teleportation:

- 1972 LaMothe (USSR)
- 1981 Shuhuang (PRC)
- 1986, 1987, Groller (USSR)
- 1990 Kongzhi (PRC)
- 1990 Jinggen (PRC)
- 1990 Banghui (PRC)
- 1996 Puthoff (USA)
- 2003 Alexander (USA)

Defies prosaic explanation

- Can neuroquantology be placed on a solid theoretical framework?



Human controlled object teleportation as reported by 1981 Shuhuang and 1990 Kongzhi

Conclusions

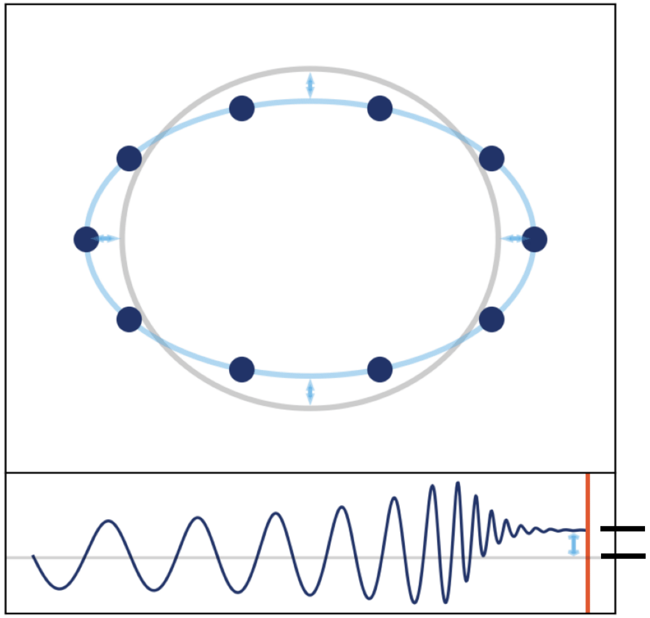
- A variety of classical and quantum approaches to gravitational field propulsion can be envisioned
- The signatures of the various approaches have yet been systematically compared but likely vary widely
- Application: Once signatures of the various approaches are fully developed it may be possible to compare them with the signatures of UAPs, for clues regarding their propulsion techniques

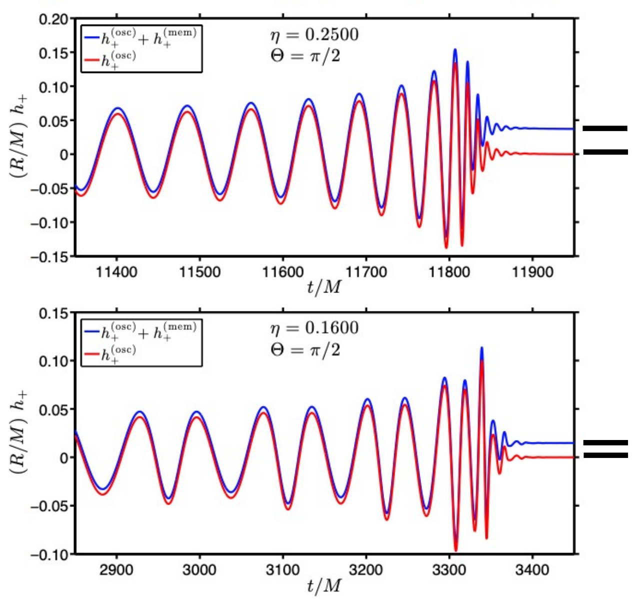
Gravitational Field Propulsion Techniques

Backup Slides

Christodoulou Memory Effect

The Christodoulou effect predicts persistent changes in the relative position of pairs of masses in space due to the passing of a gravitational wave.





Note permanent displacements after the passage of GW

Credits:
1) https://en.wikipedia.org/wiki/Gravitational_memory_effect
2) Fatava, "GW Memory, An Overview"

Einsteins General Relativity Field Equation

A change in mass – energy distribution will result in a change in space time curvature

$$G_{\mu\nu} + \Lambda g_{\mu\nu} = (8\pi k/c^4)\, T_{\mu\nu}$$

- $G_{\mu\nu}$: **Space-Time Curvature (Einstein) Tensor**
- Λ: **Cosmological Constant**
- $8\pi k/c^4$: **"Coupling" Constant, ~$2(10)^{-43}$ in MKS units**
- $T_{\mu\nu}$: **Mass & Energy (Stress-Energy) Tensor**

Where:

$G_{\mu\nu} = R_{\mu\nu} - (1/2) g_{\mu\nu} R$

$R_{\mu\nu}$ = **Ricci Tensor**

R = **scalar curvature**

$g_{\mu\nu}$ = **metric tensor**

k = gravitational constant

c = **speed of light**

References: Misner, Thorne, & Wheeler (1973), eqn 17.11
Landau & Lifshiftz (1975), eqn 95.8

GW Power as a function of Mass-Energy Variation

Radiated Gravitational Wave Power goes as the square of the change in the acceleration of the mass – energy quadrupole moment

$$d(E)/dt = -(k/45c^5)[d^3(D_{\alpha\beta})/dt^3]^2$$

Radiated Gravitational Wave Power

"Coupling" Constant, ~6(10)$^{-55}$ in MKS units

Variation in the Mass-Energy Quadrupole Tensor

Where:

$d(E)/dt$ = **GW power**

E = **GW energy**

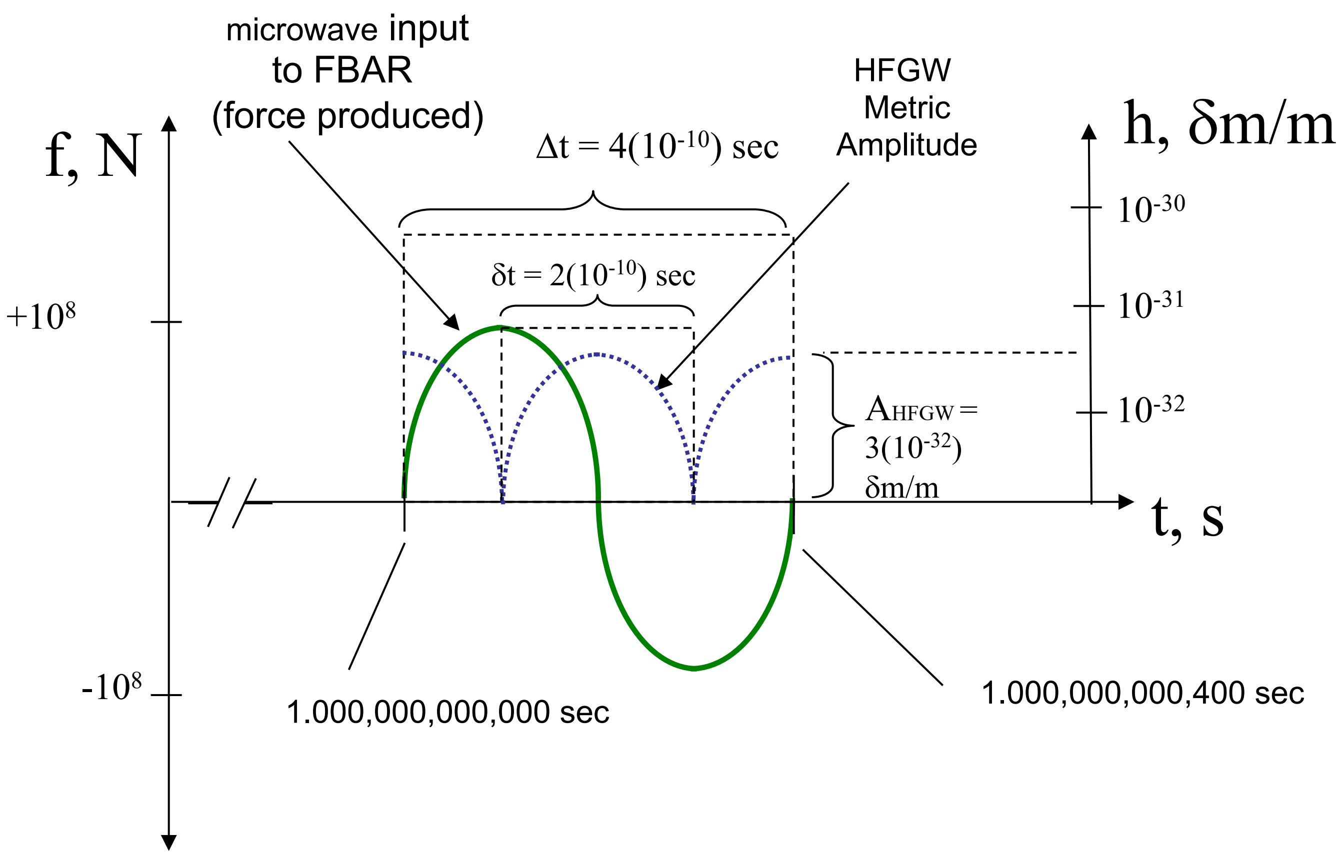
k = gravitational constant

C = **speed of light**

$D_{\alpha\beta}$ = **mass – energy quadrupole tensor**

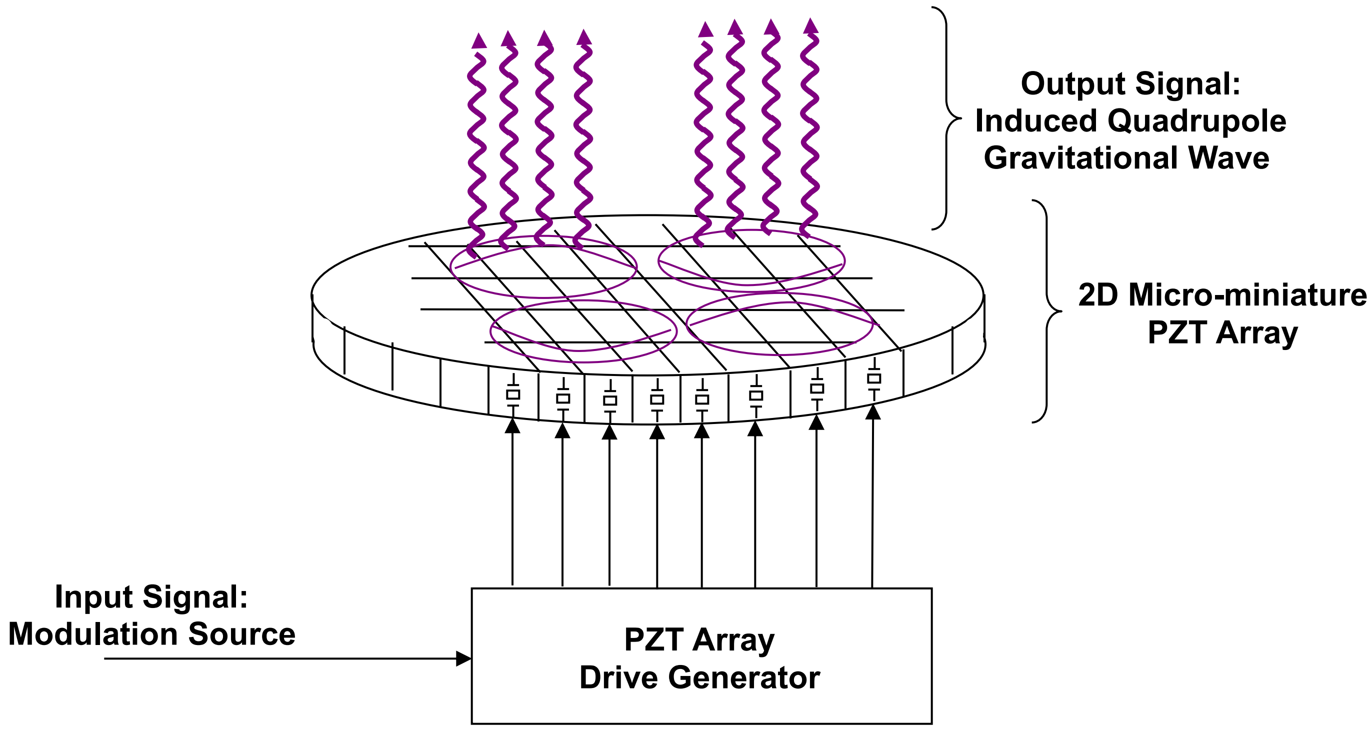
Reference: Landau & Lifshiftz (1975), eqn 110.16

Relationship between EM input and GW output frequency



Mechanical Generator Concept – Array of Sync'ed Mini PZTs (Romero & Dehnen)

Hypothesis: A PZT array can be used to create mechanical displacements in a quadrupole pattern to create gravitational waves.



Mechanical Generator Concept – Nanotechnology Electro-Mechanical (Baker)

Hypothesis: Nanotechnology arrays of actuated charges or magnets can be used as a source of gravitational wave emission.