Spectral Detection of Nonlinear RF Interactions in Biological Preparations Exposed to RF Energy

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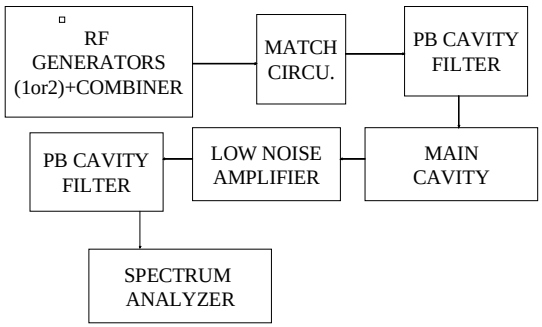
RATIONALE

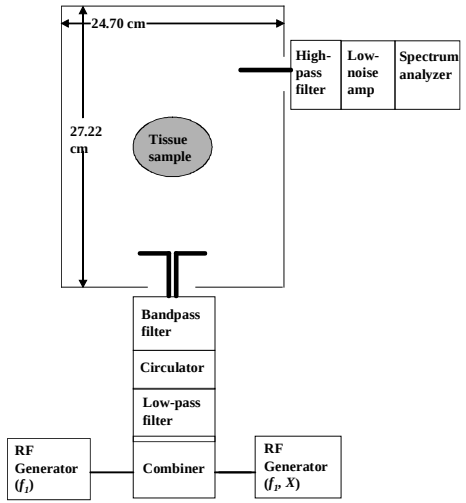
- Cellular systems have been reported to apparently demodulate an RF carrier and exhibit low frequency bioeffects
- If this occurs then cellular response is nonlinear
- This nonlinearity should also be manifest through harmonic mixing

INSTRUMENTATION

LAYOUT OF EQUIPMENT



- Stable and clean RF generators
- Cavity pass band filters (2 or 3)
- 30dB low noise amplifier and spectrum analyzer
- Main cavity with bio-preparation
- Nonlinear device for calibration
- Linear materials for bio-support structure
- Combiner plus matching circulator



EXPECTED OPERATING PARAMETERS

- Commercial cavity filters (2 or 3)
- Q ~500 –1000..
- Main cavity Q=30-40x10^3 (unloaded)
- Small bio-sample V<<1cm^3 to keep main cavity tuned with high Q
- Loaded main cavity Q ~4x10^3
- Generator frequency 900 MHz
- 10 mW power

EXPECTED SENSITIVITY

- At 1800 MHz 10-30μV/10dBm or 10-100 photons/cell/second with 10^6 cells in the bio-sample
- The cavity is detuned by the loss in the biological preparation
- Maximum sensitivity is a balance between the sample size and the cavity Q factor

DIFFICULT TASKS

- Proper calibration of nonlinearilty
- Keeping nonlinearities below detectable levels with no bio-sample
- Avoiding contact oxidation
- Removable cavity top or bottom without compromising the Q factor
- Correct location of the bio-sample in the cavity for maximum Q at 1800MHz

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