Introduction

At present the technology used for Broadcast (Both in Radio & Television) and communication industries are based on the use of spectrum, and power transmitted. Normally AM/FM/Phase modulation techniques are used in various combinations and after implementation of latest digital modulation and compression techniques the use of spectrum (Bandwidth) is saturated.

So a thought processing technology is offered in this paper (SVURG Technology).The technology has been patented under **Indian patent no**: 351456, 351458, 360271, 368356 and **USA patent no:** 10979, 368B2 and 2021/0144038A11.

After a successful lab trial the power point presentation of this technology was given in **PMO India**, dated 12th Oct 2021. The professional presents there were impressed and asked the **ministry of I&B, Government of India** to discuss and evaluate this in detail. The matter was discussed in detail with the professionals of ministry of I&B, government of India, and on their instructions a pilot project was started in collaboration with the R&D department of Prasar Bharti (PSU Government of India). Now the pilot project is in advance stage of final testing with the observation of R&D officers of Prasar Bharti. The eco system is in advance stage of implementation.

This technology will be also very useful in the field of FM and other communications fields such as mobile, telephone, satellite & defence communication etc.

SVURG®

2021

Tuesday, March 29, 2022

Brief Of Desruptive Communication (SVURG) Technology

RAKESH AGGARWAL, & O K SHARMA

SVURG Modulation Technique
"Background"

Existing Technology:-

- Existing technology needs side bands to carry information consuming large spectrum. Irrespective of modulation type, spectrum consumed is proportional to signal/data.
- Spectrum is already over saturated and has become the costliest component universally.
- SVURG Technology:-
- SVURG technique removes sidebands ,& bandwidth/spectrum needs are reduced to carrier frequency with less than 1 Hz bandwidth.
- Carrier itself can carry signals with bandwidth up to half the carrier frequency. Data multiplex of thousand times of frequency can be carried easily.
- Radiated RF power to cover the same area is reduced to fraction of a percent.

SVURG Modulation Technique
"Technology"

- Patented technique using carrier frequency itself without side bands to carry wide range of signals within carrier itself needing less than "1 Hz".
- SVURG/Z-Mod technique complies with Nyquist theorem, Shannon's Theorem and other known communication principals.
- Based on direct generation of modulated carrier wave cycle, each individually starting at zero crossing point of sine wave cycle and ending at another zero crossing point, on completion of a pure sine wave cycle, in cycle by cycle steps.
- Sine wave properties of each new cycle being generated is defined (changed) at starting zero crossing point of cycle, where the energy in cycle is zero. Change in cycle properties only happens when energy in cycle is zero.
- Modulating signal multiplex with million times more data, is sampled at carrier frequency, and its sampled one static value for one cycle period defines carrier cycle generation properties.
- **RF Power required for same area coverage is reduced to fraction of a percent, derived from MDS (Minimum Detectable Signal) formula:-**

"MDS (dBm) = 10Log(kTo*1e3) + NF + 10Log(BW) + SNR dB" ..... (thermal noise floor)

SVURG/Z-MOD/ TDR SYSTEM
"Advantages"

- Reduced spectrum, million time more data capacity, reduced power requirement. Fully compliant to known engineering principals.
- Reduces health hazards in personal devices as it is a green technology .
- Reduces operational costs to 0.1% with increased number of channels and low power. Most of existing facilities & infrastructure of existing Radio stations, is fully usable for smooth implementation.
- It includes all features of DAB, DRM, HD Radio and other system combined and adds dozens of new features, not possible with existing modulation technology.
- Receiver design is simple and does not need complex DSP processing.
- Has capacity to provide 100% secure communication with robust and diverse security.
- Commercial potential in trillions of Dollars in royalties alone.
- Proof of concept, lab tests successfully conducted and complete end to end echo system development in process. A prototype project is in advanced stage of development in collaboration with R&D department of Prasar Bharati.

SVURG/Z-MOD/ TDR SYSTEM
"Potential"

- Qualitative improvements coupled with unparalleled security is bound to have disruptive effect , motivating all players smallest to largest , to switch over to SVURG technology.
- Z-Mod technique will provide beyond imagination advantages in:-
  - Mass media segments like Radio and TV broadcasting'
  - All modes of telecommunications systems including Cellular, point to point etc.
  - Improve satellite communications and space exploration.
  - Transform broadband and Wi-Fi data delivery with lightning speeds
  - Provide new impetuous to secure connected devices and systems
  - Provide hundreds of time more secure communication for defence and security agencies.
- **Generate millions of jobs , as compulsory make in India licensing possible with Gov't. support**
- **Provide echo system push for electronics manufacturing in country**

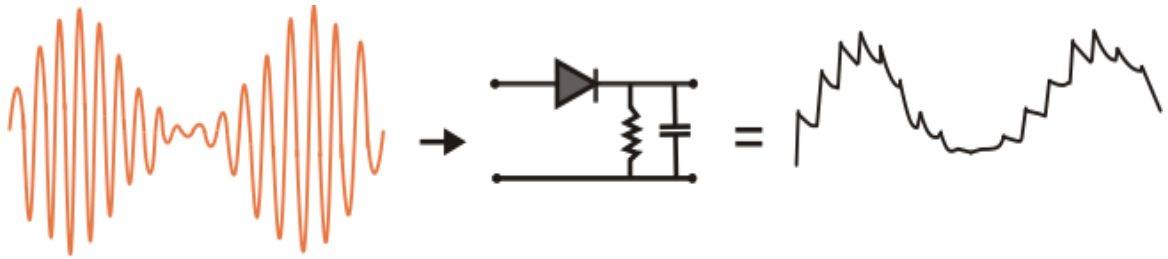
SVURG/Z-MOD/ TDR SYSTEM

"Next Steps"

- **Recognition:-** Creation of a task force to evaluate commercial, technical as ell as social aspects of technology in global perspective
- **Planning:-** Formation of a working group of stake holders to formulate all new policies and create new standards.
- **Implement:-** Government Backing and support to speed up building a usable working system.
- **Pilot project:-** Authorise and support a pilot project for field trials.
- **IP Protection:- and** Basis of this project is Intellectual Property, which need protection support from Gov't in national interest.

Common AM peak detector
"Eye opener"

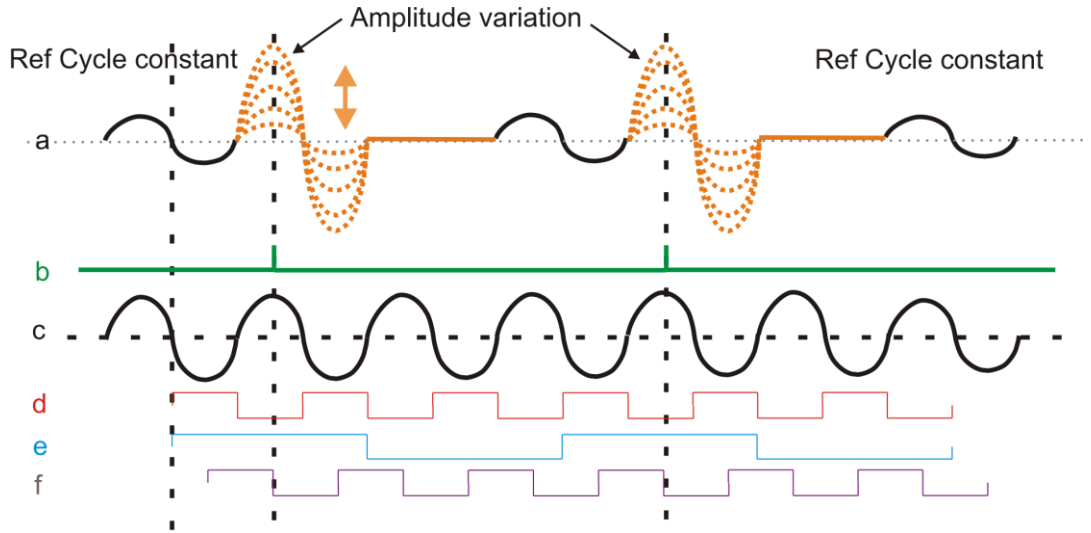
- Figure shown is special for poor signal performance with only ten times frequency ratio between carrier & audio signal recovered. If the ratio is of carrier and signal becomes small the detected signal becomes distorted and filter is not able to reproduce original signal properly.



Typical AM detectiom

Precision AM Synchronous Detector "SVURG"

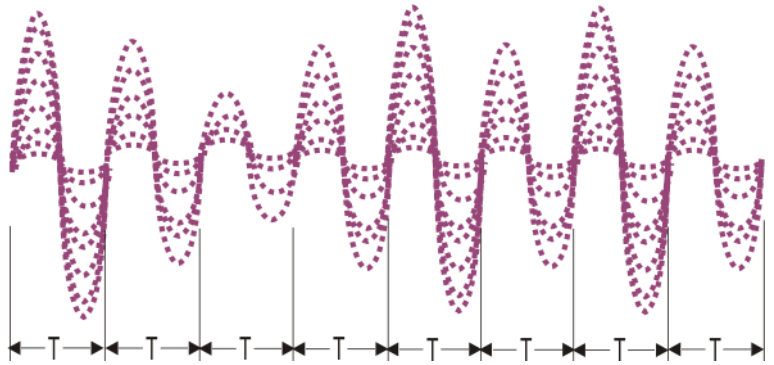
- The figure is for a precision synchronous detector used for SVURG technique to yield one data byte per field duration.
- Which is one sample value every three cycle time period.
- The first carrier cycle in trace "a" is a reference cycle to establish timing and amplitude reference for fail safe signal detection.
- Traces "b" to "f" are for reference timing to locate peaks



AM Precision Synchronous Detector

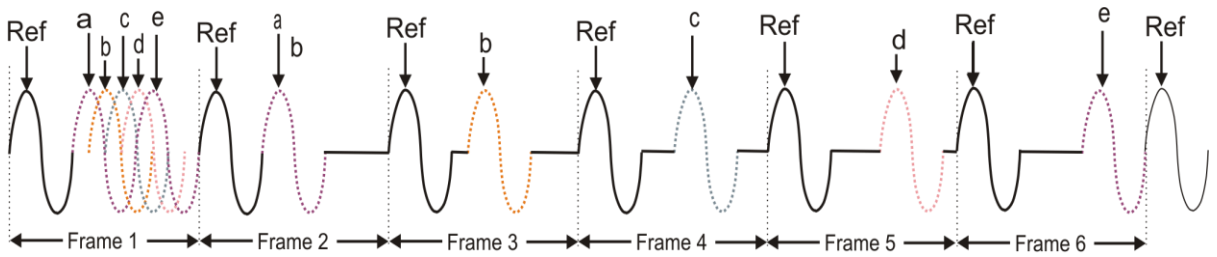
SVURG modulated waves
"AM Backward Compatible"

- The figure shows 8 cycles of the carrier generated by the SVURG technique.
- The multiple amplitude waves hownn in each cycle time is to establish variation in amplitude of each pure complete sine cycle of the modulated carrier.
- Time period T =1/F
- Al cycles are generated starting at one zero crossing to ending at another zero crossing maintaining its sine properties constant for one complete cycle.



SVURG modulated waves "PM"

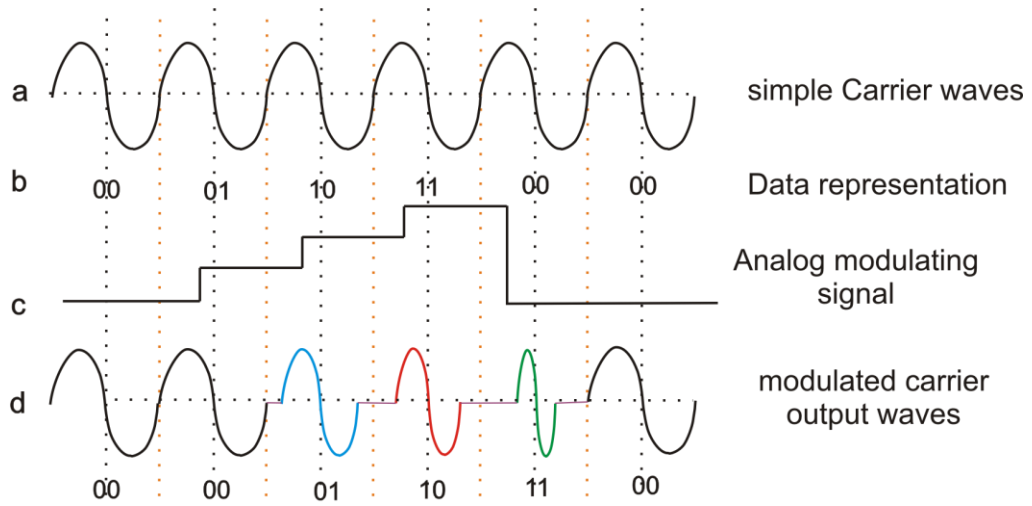
- Typical phase modulation scheme with each frame of 3 cycle duration,
- First cycle is a reference cycle to establish zero phase position.
- Cycles "a" to "e" are data cycles in 5 different frames.
- Frame 1 shows them together to establish their relative starting phase.
- Frames 2 to 6 shows them in real time positions with 90° phase change.



SVURG Phase modulation

SVURG modulated waves "FM"

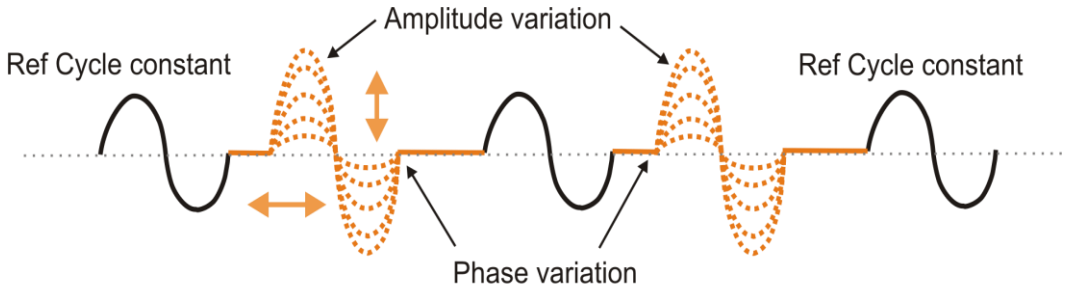
- The figure shows wave forms for SVURG modulate FM output.
- Note the frequency change with every level change in modulating signal has been shown extra ordinarily large for easy visibility and in practice the difference between each level could be few Hz only, First two and last cycle represents zero signal where the cycles become continuous sine wave.



FM Wave forms

SVURG modulated waves
"AM + PM"

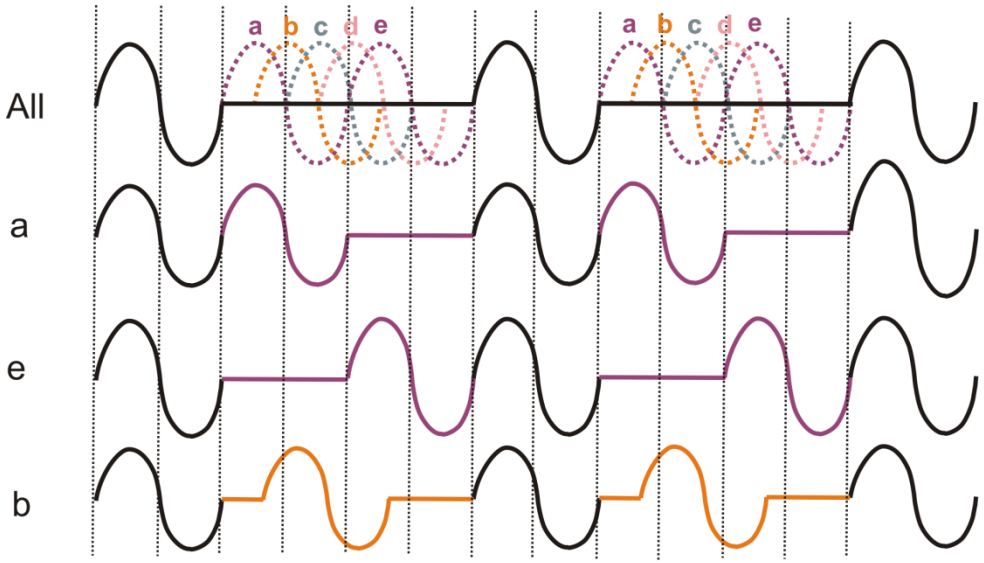
- The figure shows SVURG modulation with two sine parameter change in every frame of modulated signal.
- In this implementation the previously explained data cycle in frame could carry two independent data bytes.
- One data byte is represented by amplitude change of data cycle
- Second data byte is represented in lateral phase variation w.r.to reference cycle.



SVURG DOUBLE modulation wave forms

SVURG modulated waves "PM"

- The picture depicts phase modulation concept iusing SVURG principals
- Trace "ALL" shows 5 different sine cycle positions at 0°, 90°, 180°, 270°, and 360° phase angles for data cycle.
- Trace "a", "e" and "b" show 3 different sine cycle positions at 0°, 360°, and 180° phase angles for data cycle.
- With present devices time resolution of fractions of Pico Second will provide data byte lengths of 20 bits easily.



SVURG phase modulation wave forms

Thank you

Brief Introduction of Sh. O.K. SHARMA, ADDL. DIRECTOR GENERAL (Engineering Retired) PRASAR BHARTI

Sh. O.K. Sharma, Ex. Addl. Director General (Engineering), Prasar Bharati is an IBES officer of 1984 batch. He had done his graduation in Engineering in Electronics & Communication from University of Roorkee (NOW IIT Roorkee). He has worked as Addl. Director General (Procurement), Prasar Bharati. He has worked as Additional Director General in Doordarshan News for six years as Engineering Head. He has the vast working experience of project implementation of All India Radio & Doordarshan, and he has headed the programme division of North Zone and North East Zone of All India Radio.

He has a working experience of 37 years which includes two years working in U.P. Electronics Corporation. He has attended various training courses and workshop cum seminars in India and abroad in the field of modern technology and management.

Sh. O.K. Sharma, ADG is ex-President of Broadcast Engineering Society (India). He is ex-President of Association of AIR & Doordarshan Engineer Association (ADEA). He was holding the charge of Sr. Vice President of Prasar Bharati Cricket Club and was Chairman of organizing Committee of Tournaments. He was the founder President of RWA of Metro Staff Quarters (radio Colony) for four years. While holding the charge of various social organisations, he has discharged the duty related to social work successfully. He was a member of various committees constituted by Prasar Bharati.

Mr. Rakesh Aggarwal is an Ex ISRO scientist and founder of COMCON group of companies. He is the inventor and holder of more than half dozen patents including the SVURG/Z-Mod technology. He is known worldwide for his expertise in prominent digital radio standards DRM and HD Radio and commissioning of world's largest digital radio network of AIR/Prasar Bharti. Conceptual broadcasting application of **"SVURG" technology**, is covered in a book titled **"A Disruptive Approach to Digital Broadcasting"** published by and available at Amazon worldwide.