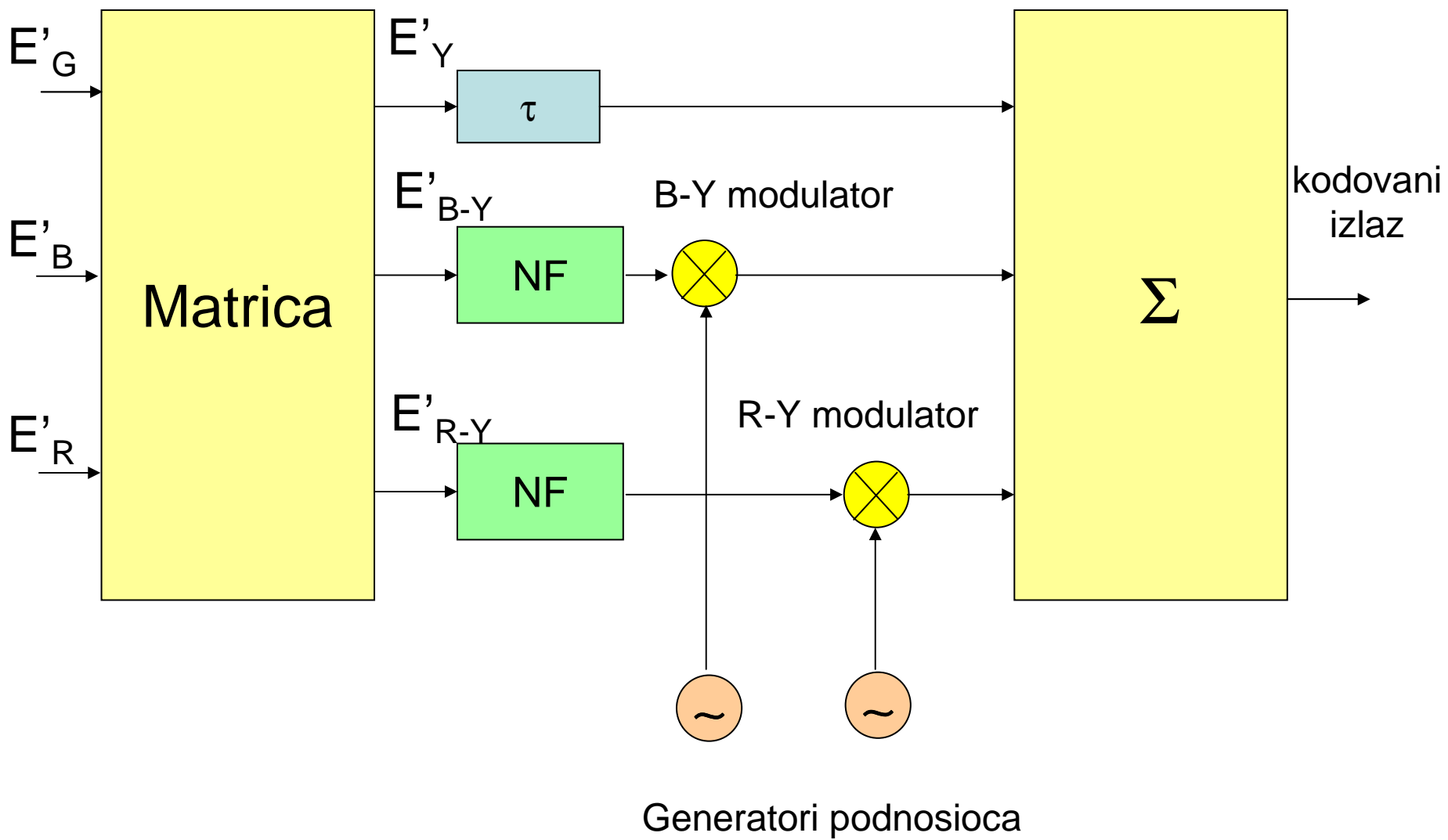
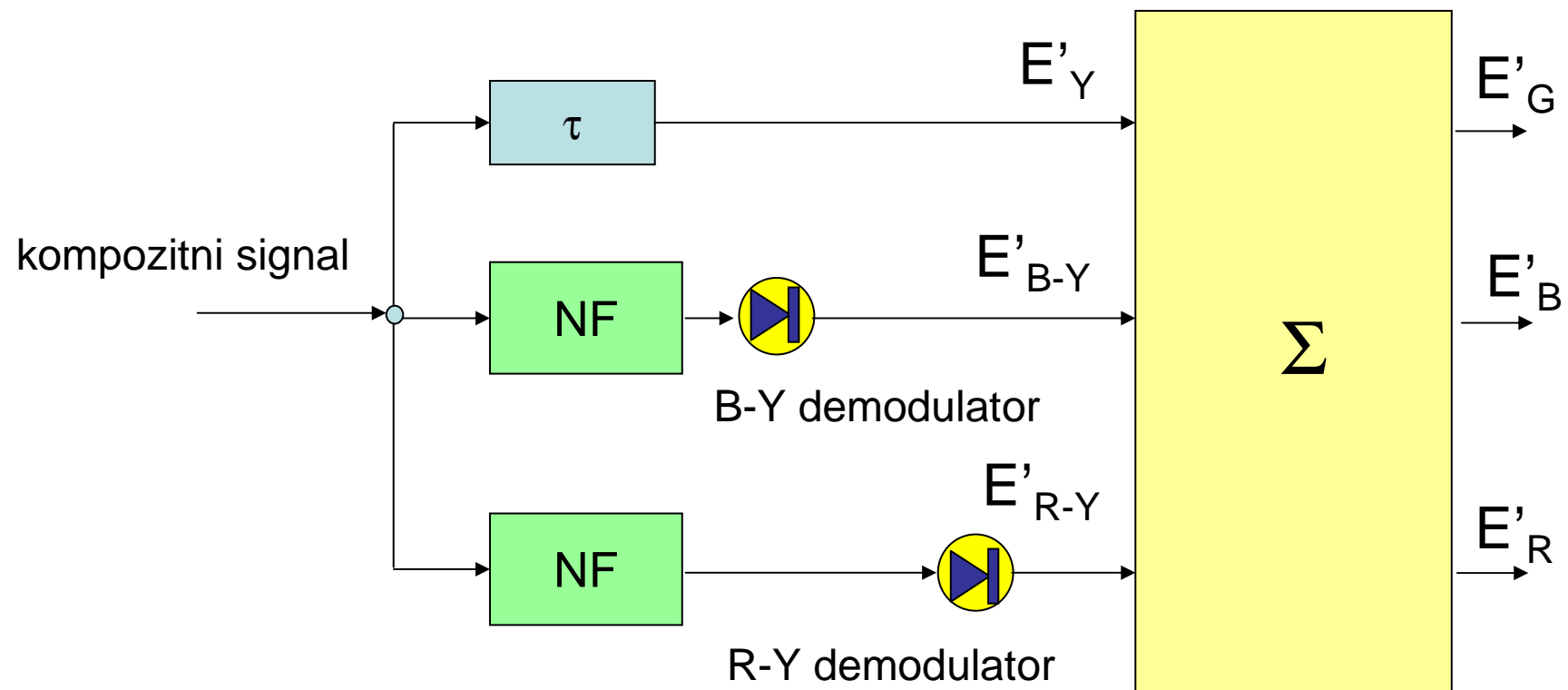


# Analogna TV - 1

Irini Reljin



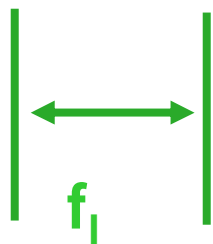


Uprosceni spektar stacionarne (monohromatske) scene  
u analizi sa proredom  
(broj linija u slici je neparan)

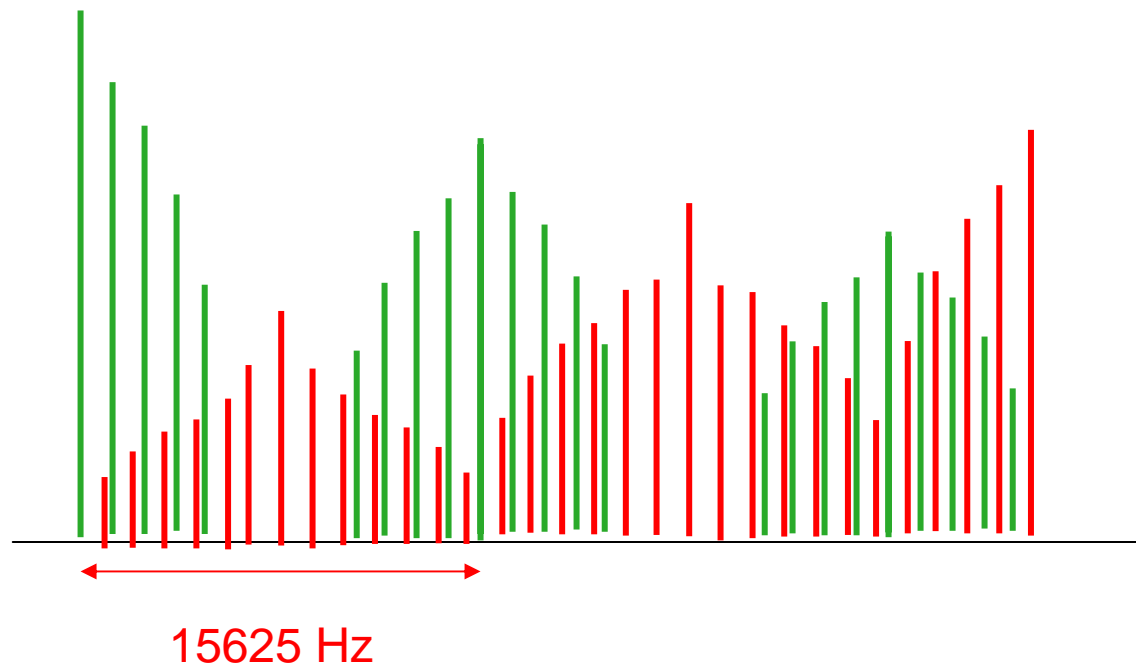


15625 Hz

15625 Hz



**Gde ubaciti boju?**  
**U NTSC-u je odabran polulinijski offset**  
**za ucesljavanje spektara lumentnog signala i boje**



Spektri se ucesljavaju – comb filter  
Posledica **polulinijskog offset-a** i **analize sa proredom**:  
preslusavanje

## Izbor opsega za hrominentne signale

- Za vidne uglove veće od  $20^\circ$  vid je trihromatican
- Za uglove  $10^\circ$  -  $20^\circ$  vid je dihromatican
- Ispod  $10^\circ$  vid je monohromatican.

- Broj perioda po stepenu vidnog ugla je

$$N = n / (\arctg(1/(200D)))$$

D je rastojanje od objekta u (m)

# Izbor nosioca boje

Ako se uzme  $D=6H$ :

- trihromatican vid se ima u opegu 0.6 MHz
- dihromatican u opsegu 1.3 – 1.5 MHz
- Iznad 1.5MHz, oko je monohromaticno.
- Nosioc mora biti udaljen najmanje 600kHz od max spektralne komponente lumentnog signala

# Izbor nosioca boje

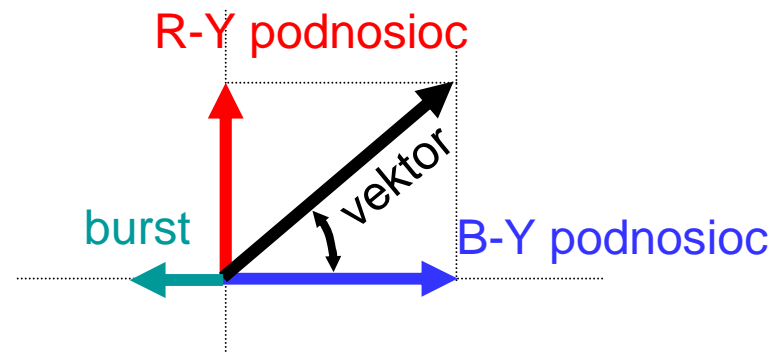
NTSC:

$$f_{sc} = 455/2 f_h$$

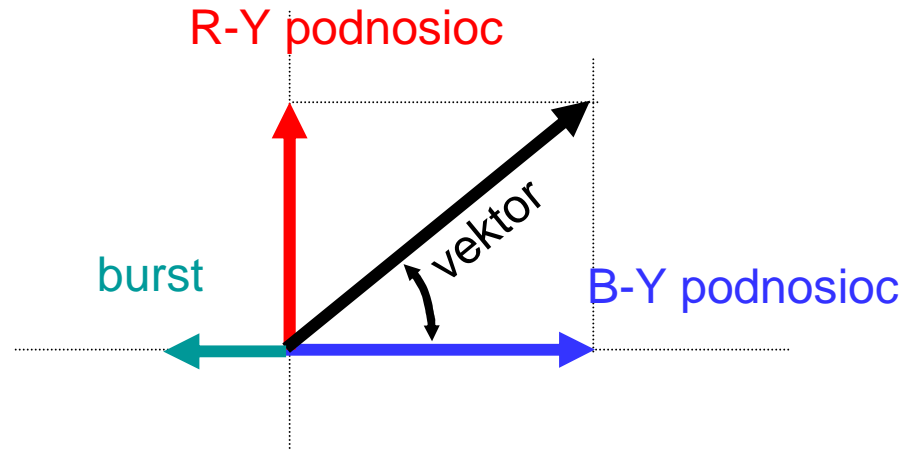
$f_{sc}$  – frekvencija podnosioca boje

$f_h$  – linijska (horiz.) frekvencija

Hrominentni signali se prenose u kvadraturi  
(fazni pomeraaj od  $90^\circ$ )



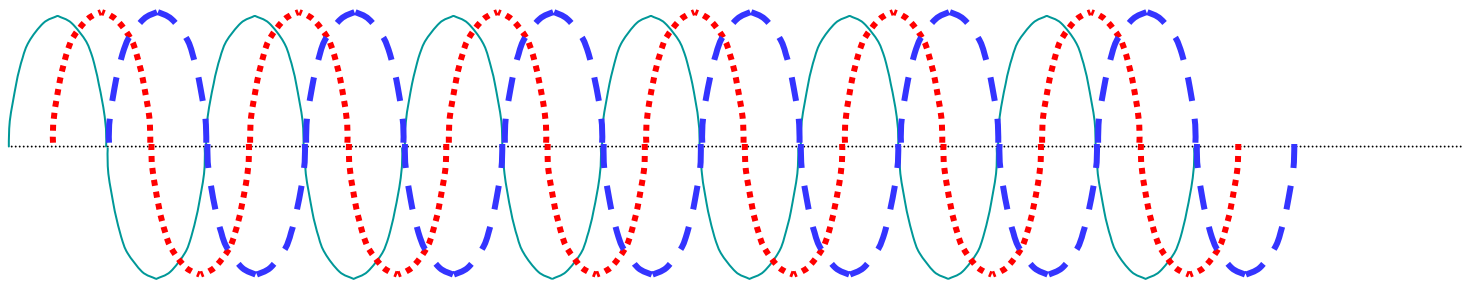




burst

R-Y

B-Y



# Izbor nosioca u PAL sistemu

- PAL – Phase Alternating Line – manja osetljivost na fazna izoblicenja

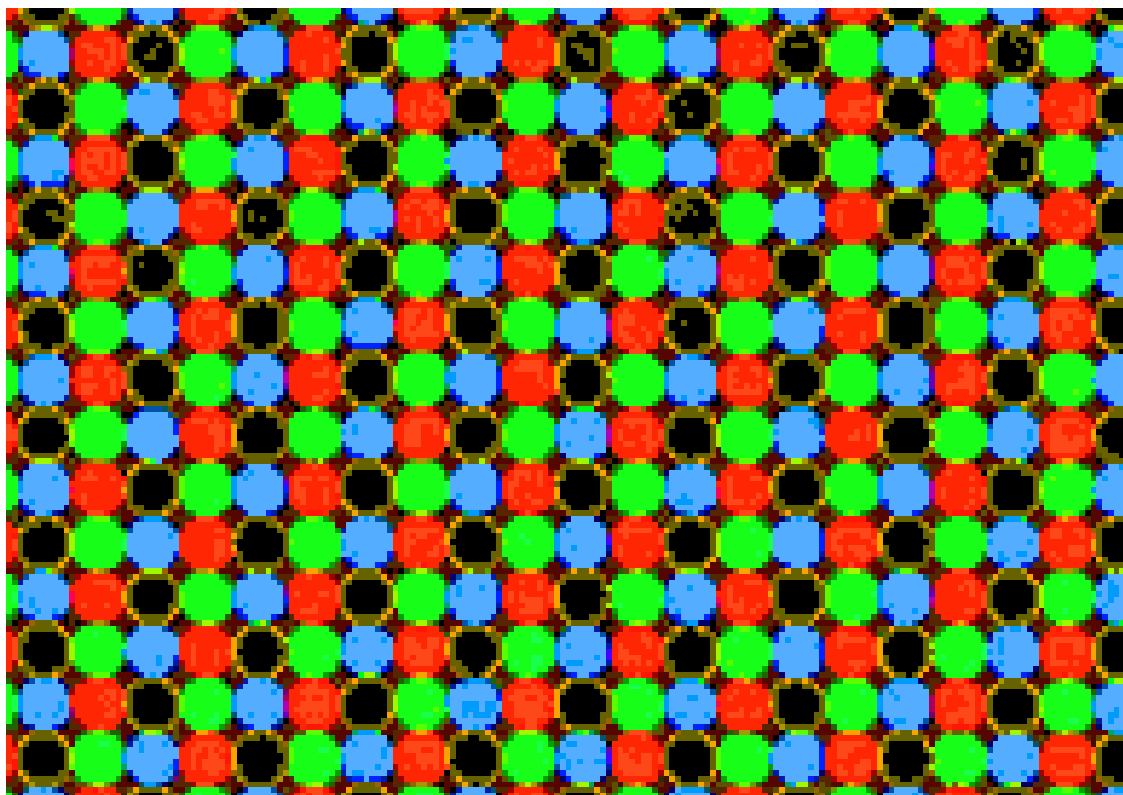
$$f_{sc} = (284 - 1/4) f_h + f_v = 4.4361875 \text{ MHz}$$

$$f_v = 25 \text{ Hz}$$

polulinijski ofset izmedju hrominentne i luminentne komponente bi izazvao prelusavanje  $E_v$  i  $E_y$  spektralnih komponentata

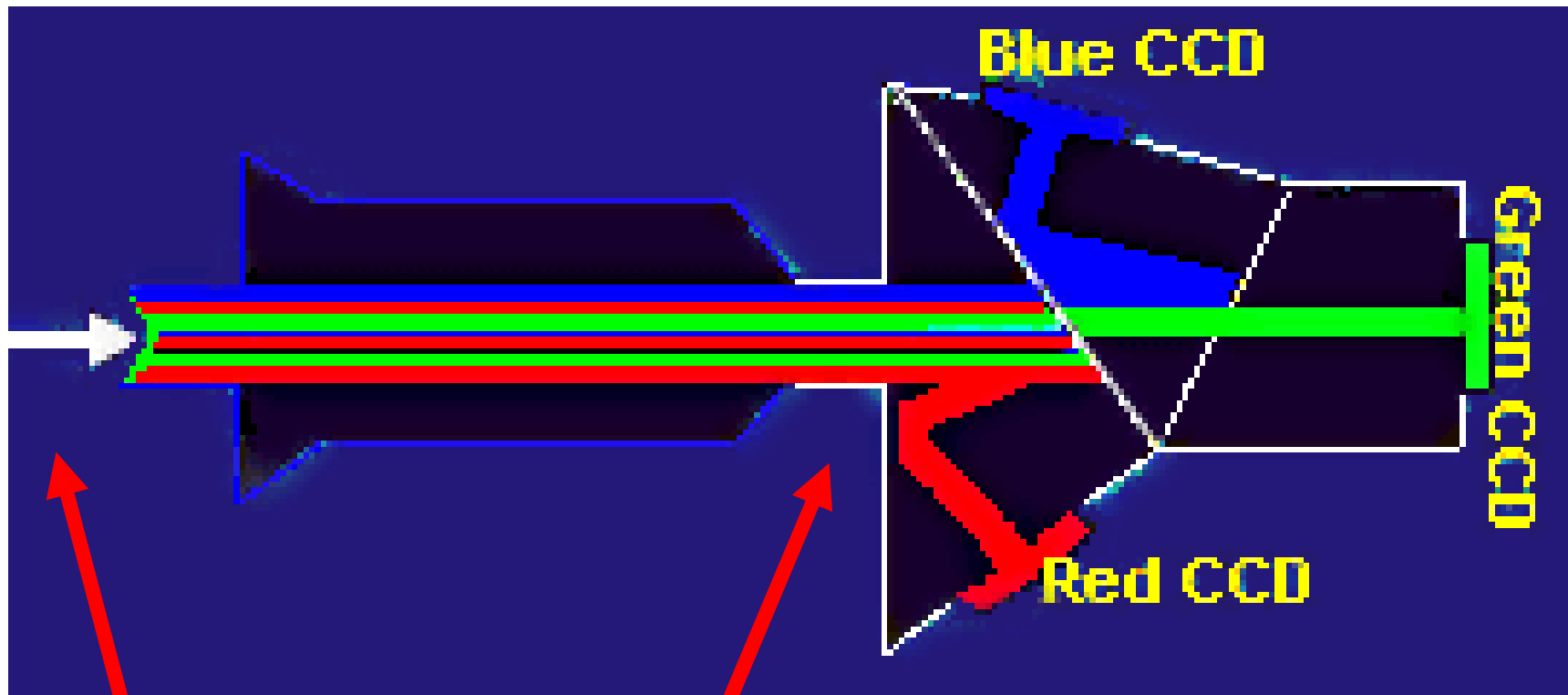
## PAL poboljšava vidljivost slike

- preslusavanjem hrominentnih komponenata u luminentni kanal se dobija tackasta struktura slike,
- ta smetnja je najmanje vidljiva pri rasporedu tipa sahovskog polja,
- cetvrtlinijskim pomerajem smetnja je kosa
- raspored tacaka u poluslici prostorno pomeren (offset)



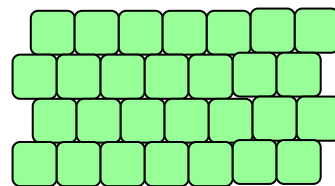
Uvecana slika  
mozaika kolor filtara  
u kolor kameri koja  
sadrzi samo 1 cip.  
Profesionalne kamere  
sadrze 3 cipa –  
po jedan za svaku boju

Kolor slika aktivira svaku tacku na mozaiku.  
Razdvajanje slike se vrši iza cipa  
po kljucu rasporeda tacaka.

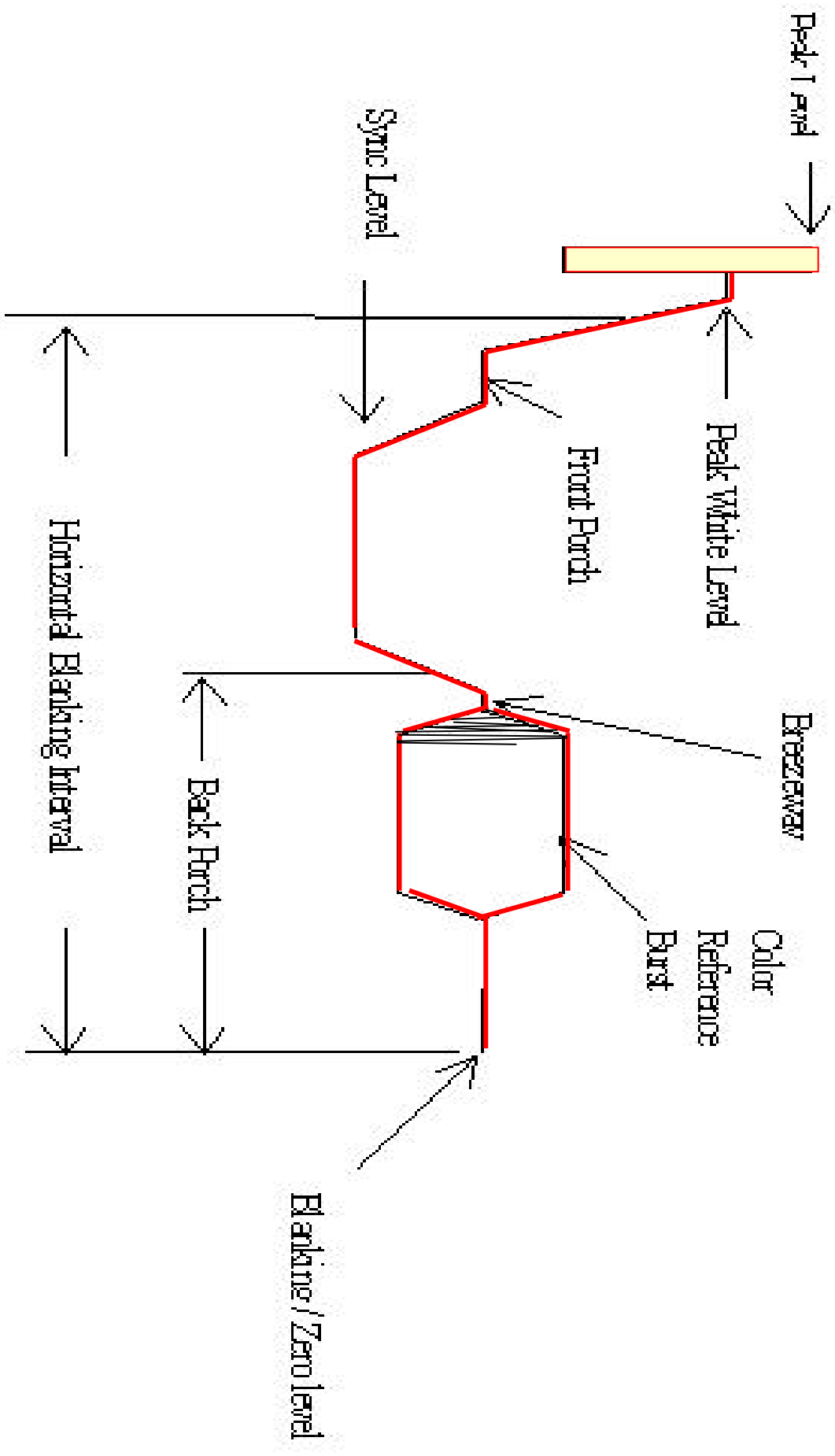


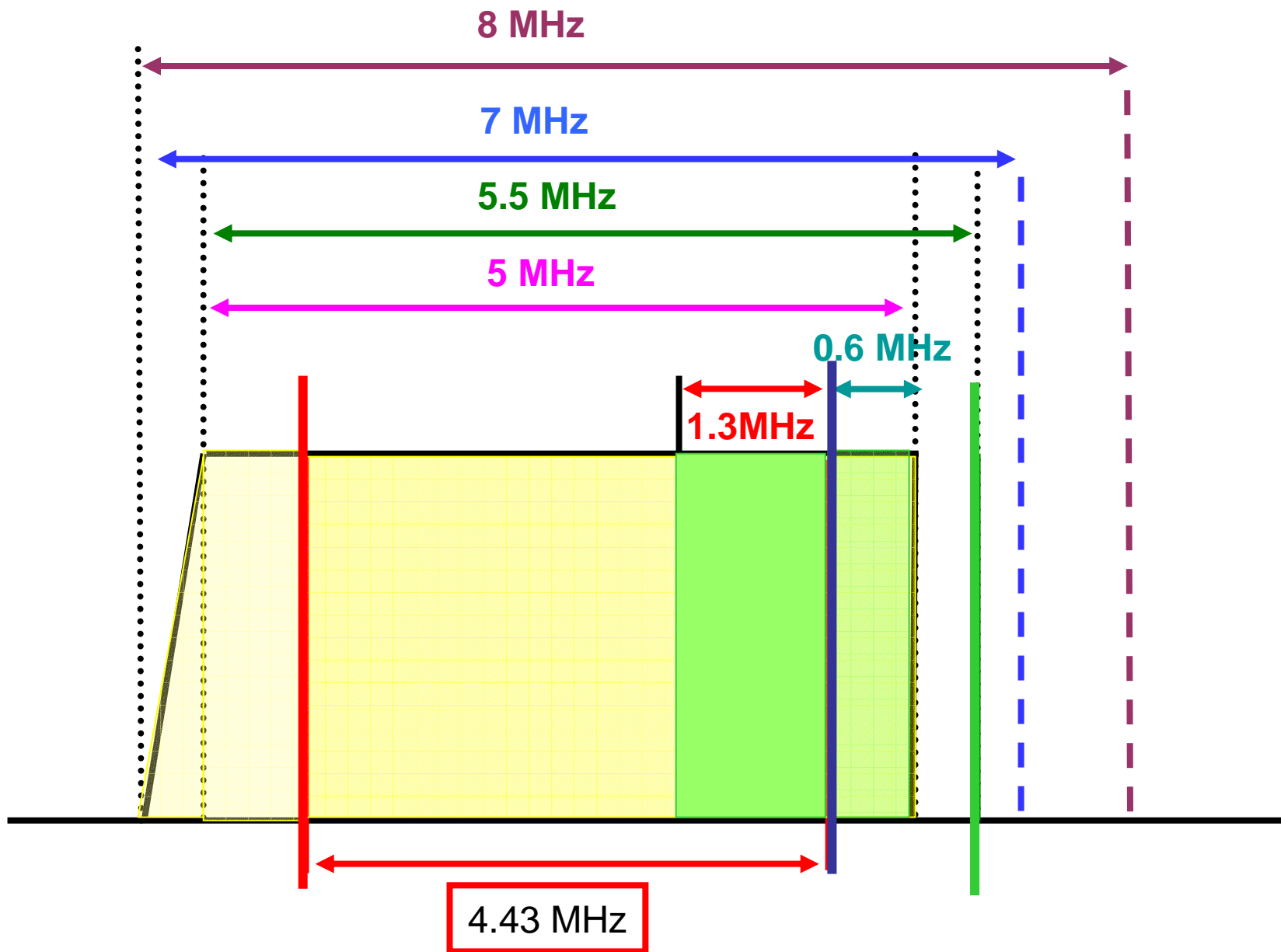
kolor slika

beam splitter

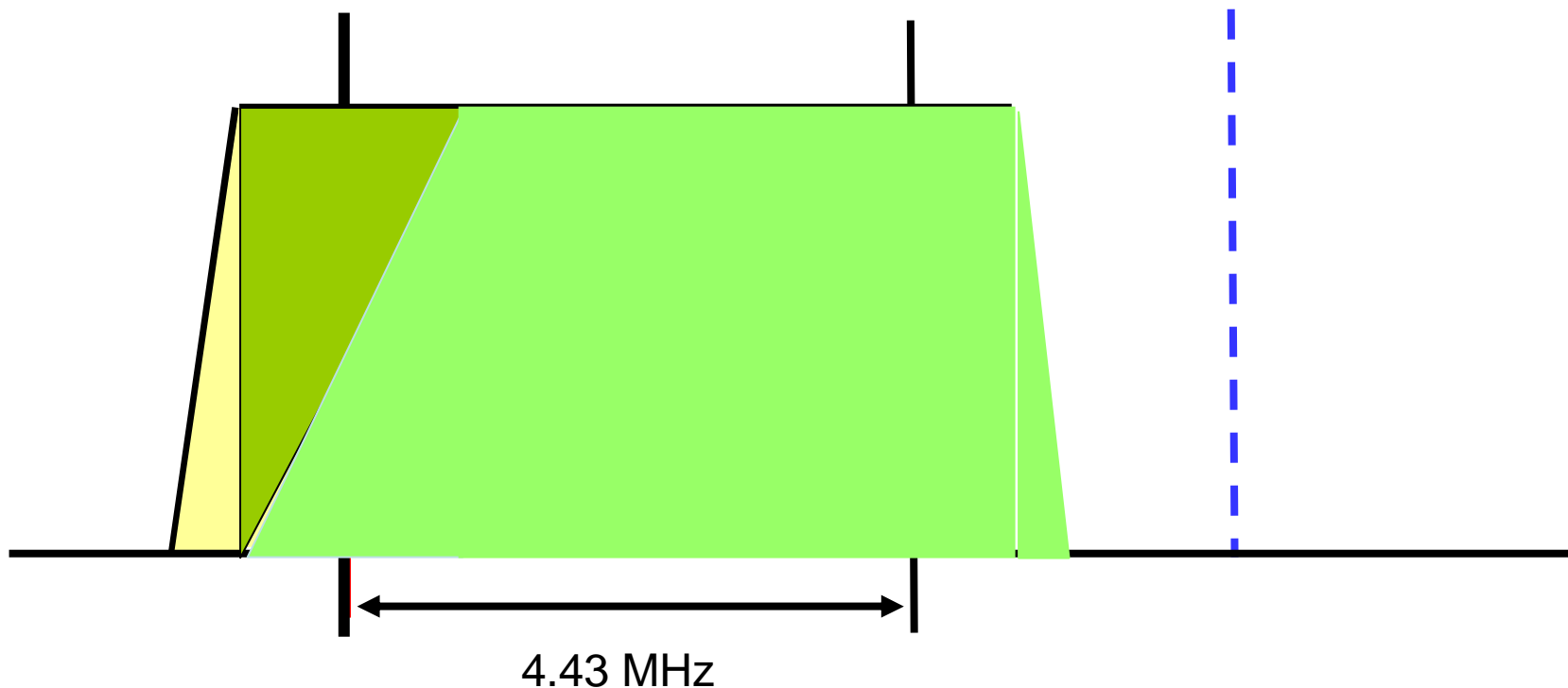


raster sa offset-om

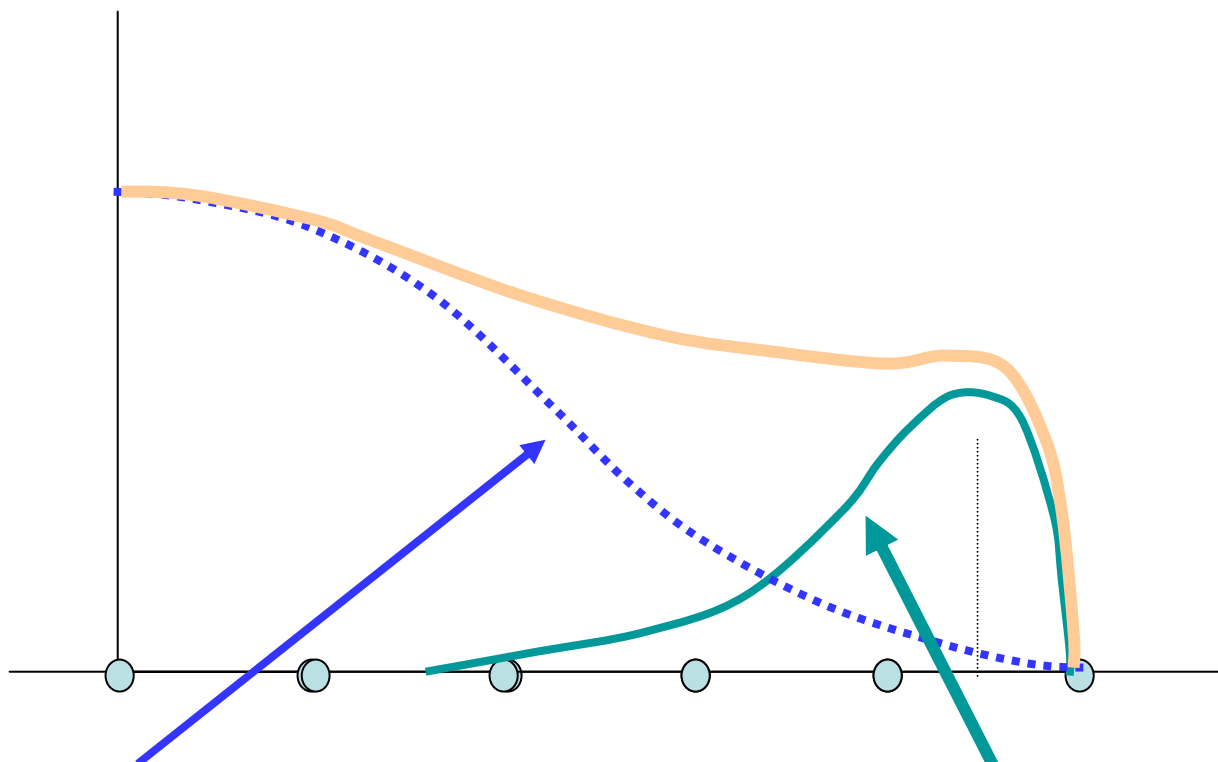




# Selektivnost prijemnika – radi kompenzacije nesimetričnog bocnog opsega luminentne komponente signala







spektar luminentog signala

spektar hrominentnih komponenata

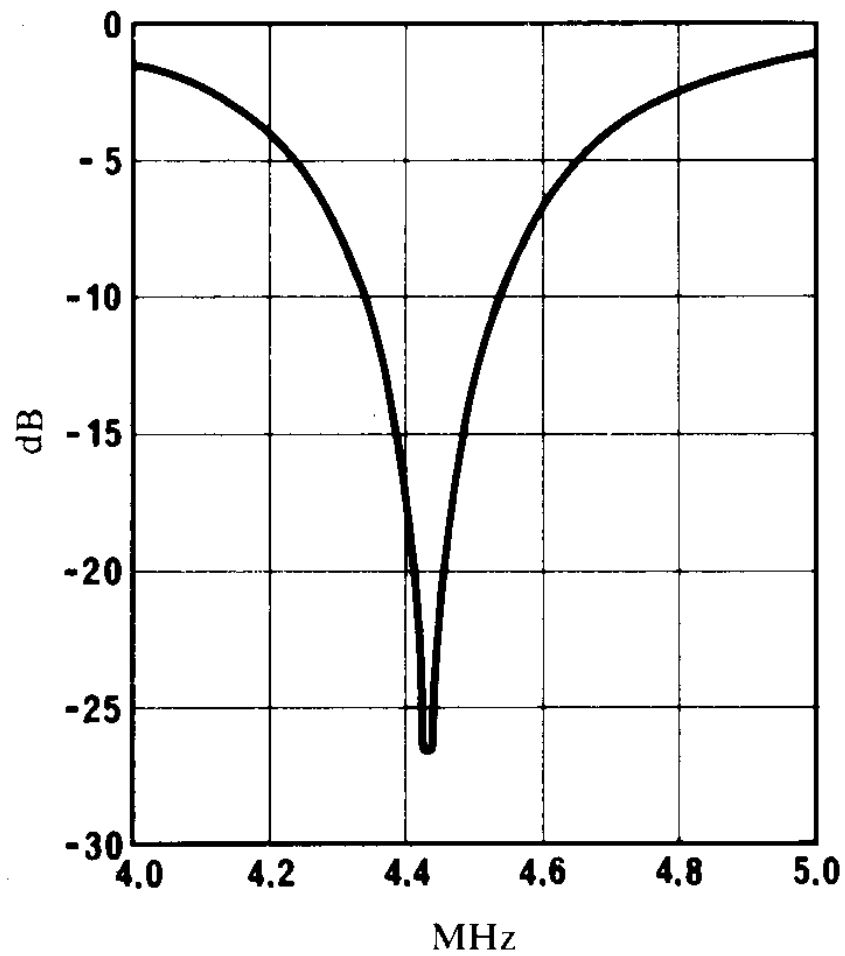
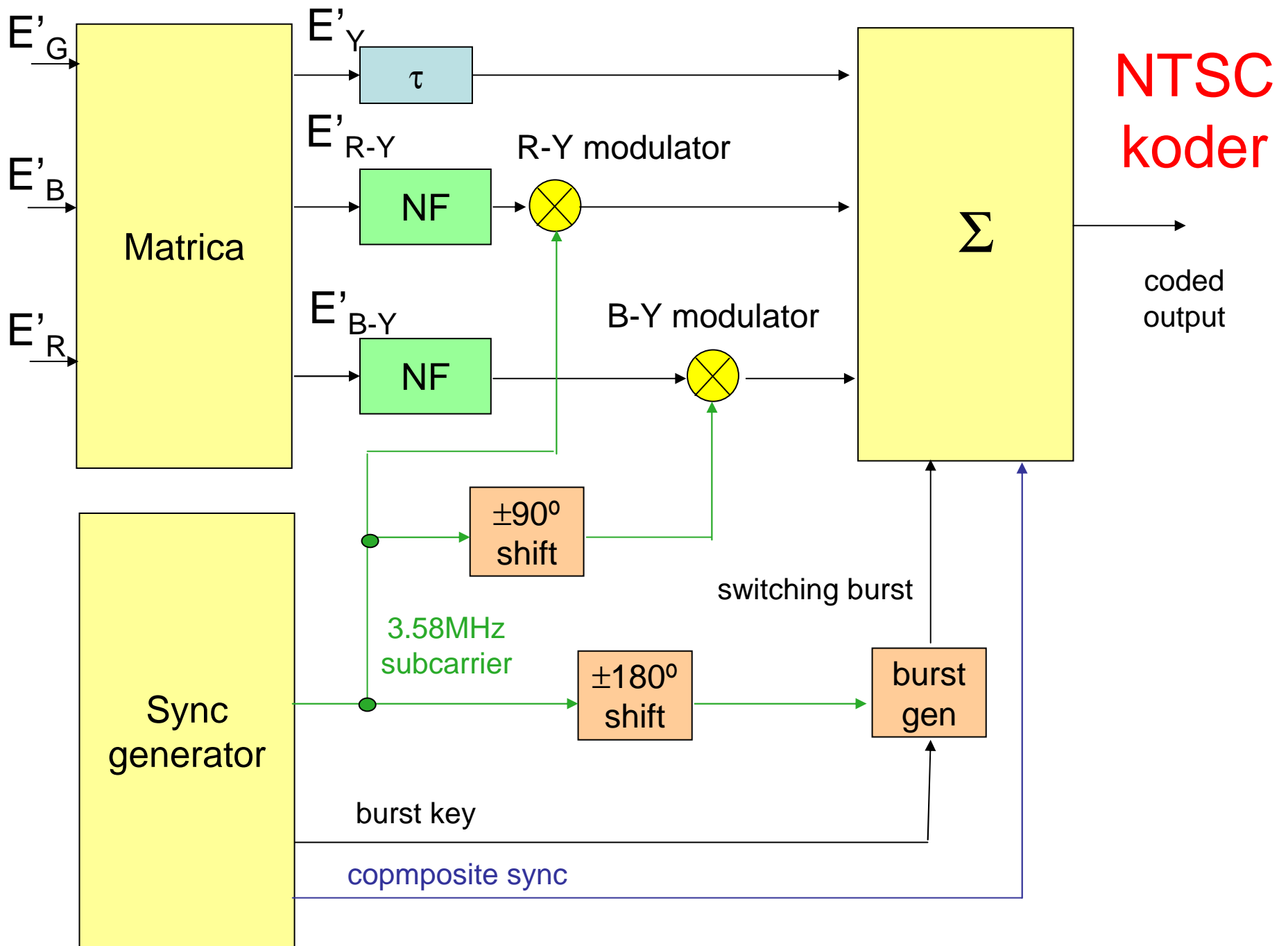


FIGURE 8 – *Response of sub-carrier notch filter for 625-line systems*

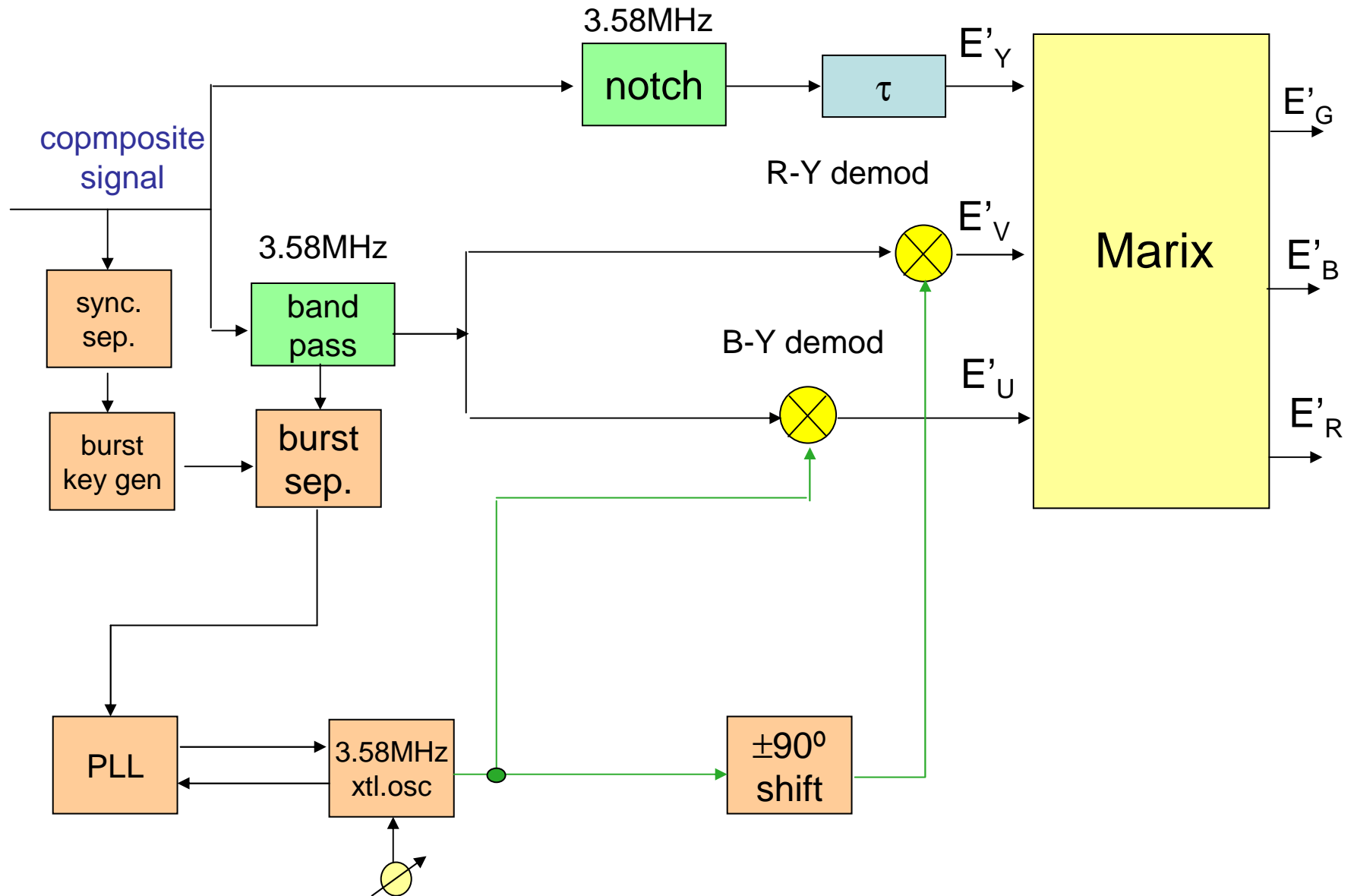
3 dB bandwidth: 600 kHz

Attenuation at 4.43 MHz  $\geq$  26 dB

d08-sc



# NTSC dekodeer



# NTSC dekodeer

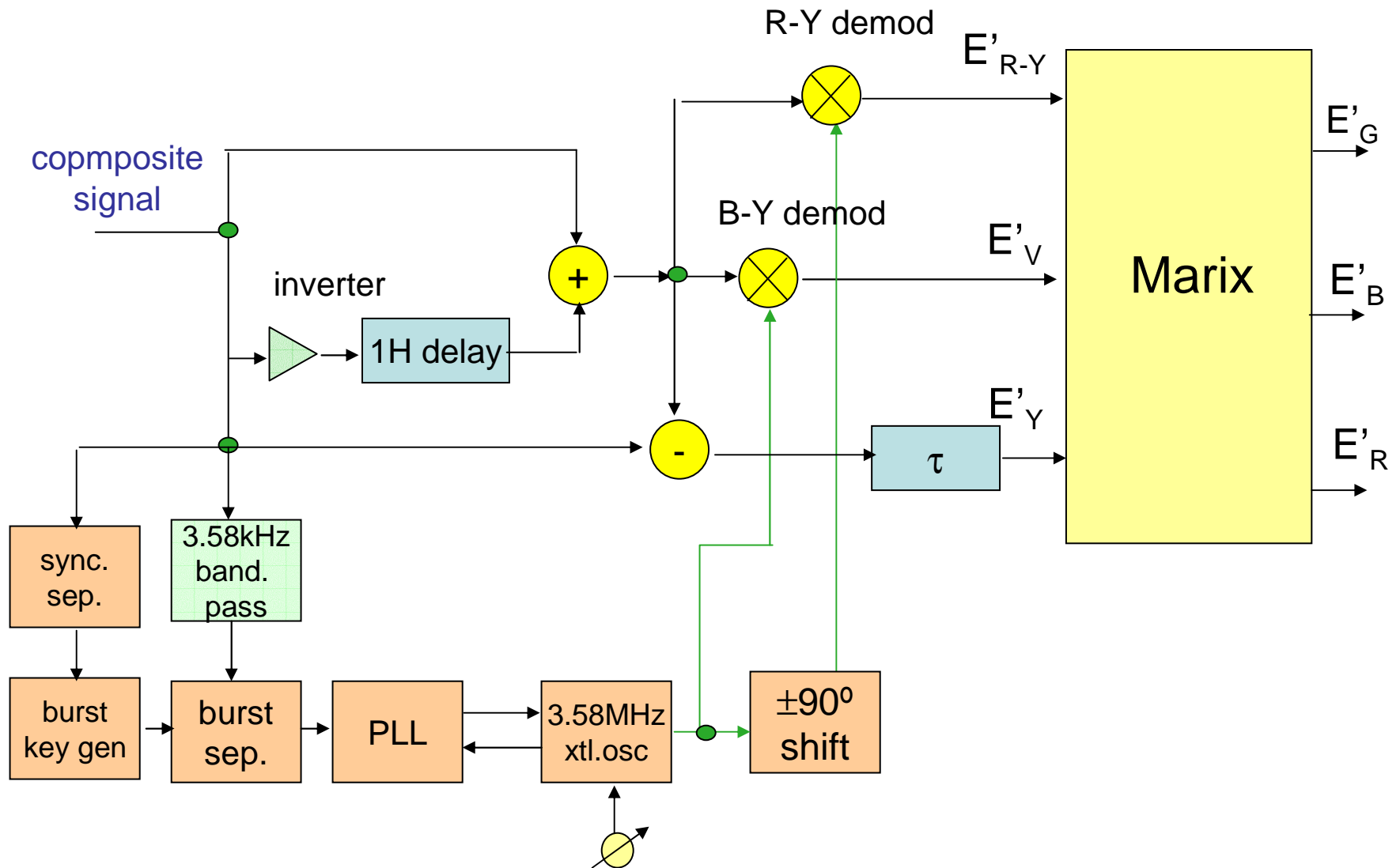
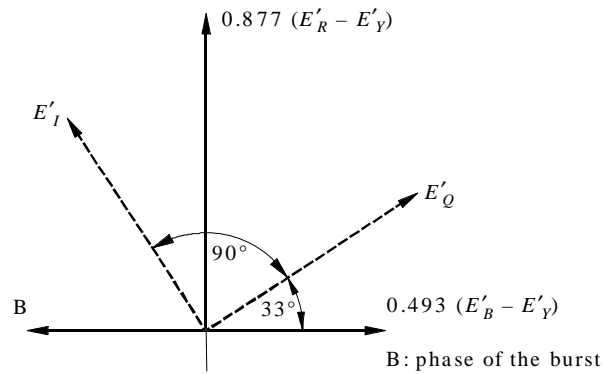


FIGURE 4  
Chrominance axes and phase of the burst



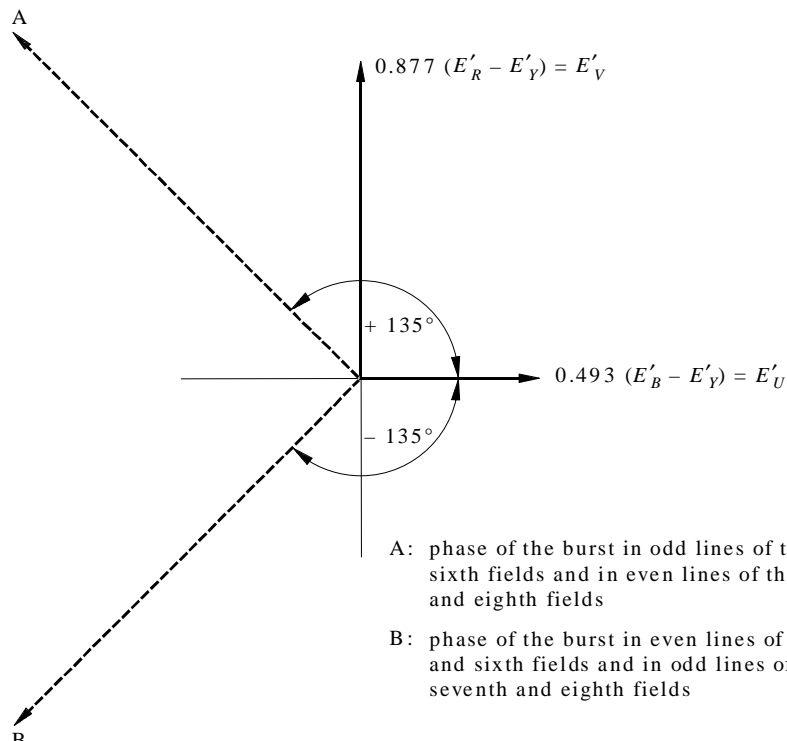
a) NTSC system

**NTSC**

**ITU-T  
J.63**

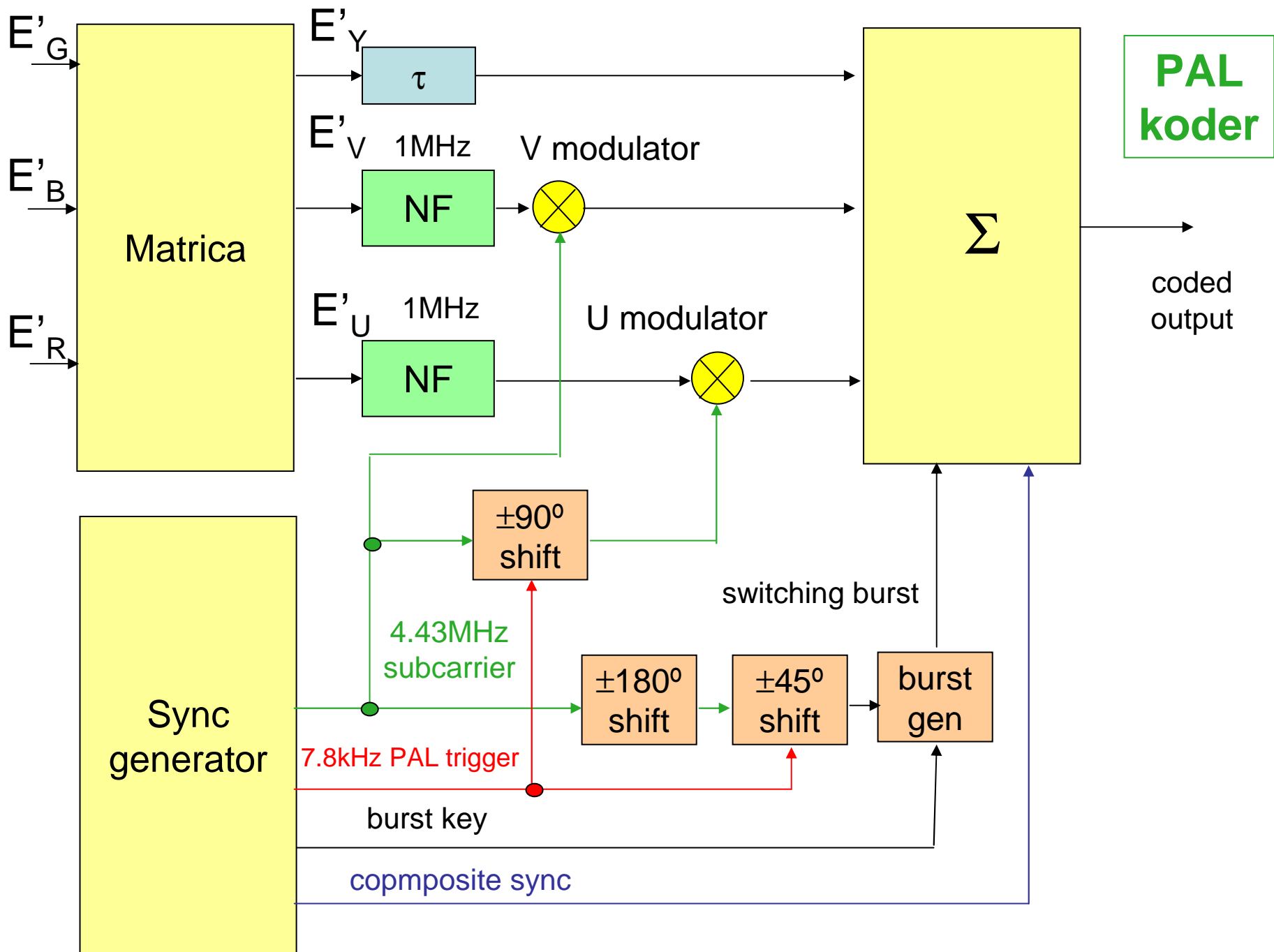
## Faza burst signala

**PAL – faza burst-a se menja  
izmedju  $+135^\circ$  i  $-135^\circ$   
Burst se ne prenosi u 9.liniji  
V.pov.int. – da bi faza pocela  
sa  $+135^\circ$  (Bruch blanking).**

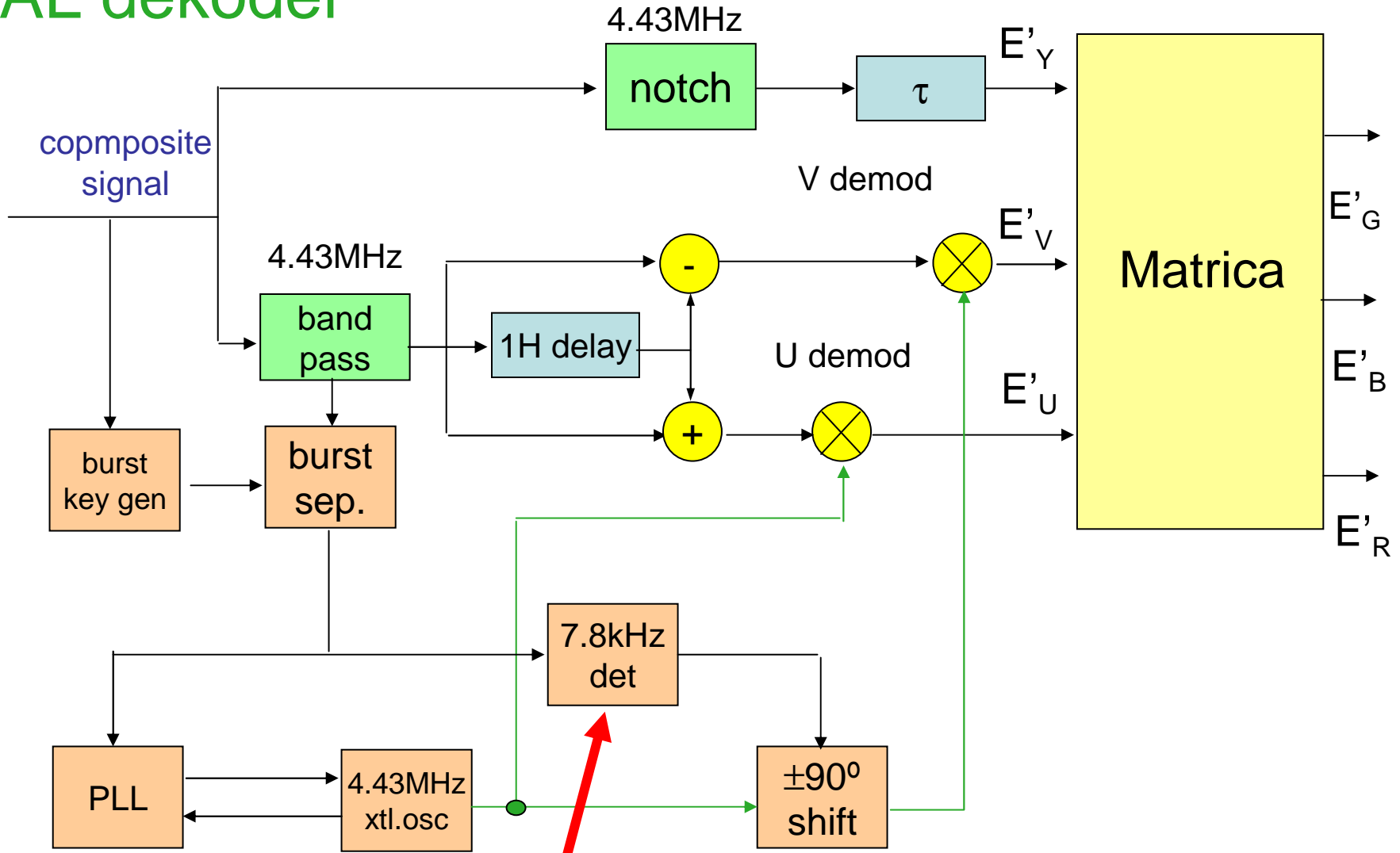


A: phase of the burst in odd lines of the first, second, fifth and sixth fields and in even lines of the third, fourth, seventh and eighth fields

B: phase of the burst in even lines of the first, second, fifth and sixth fields and in odd lines of the third, fourth, seventh and eighth fields



# PAL dekodeer



Faza nosioca u U dem. je konstantna, a faza nosioca u V dem. se menja za  $\pm 90^\circ$  u svakoj liniji (7.8125kHz) prema U nosiocu.



## The Main Video Signal Standards

Name	Frame/Field rate	Aspect Ratio	Scan Lines
	TV standard	Colour System	Subcarrier Freq
NTSC	29.97/59.94	4:3	525
	EIA	NTSC	3.58MHz
PAL-M	29.97/59.94	4:3	525
	EIA	PAL	3.58MHz
SECAM-M	29.97/59.94	4:3	525
	EIA	SECAM	?.??MHz
PAL	25/50	4:3	625
	CCIR	PAL	4.43MHz
SECAM	25/50	4:3	625
	CCIR	SECAM	4.25/4.40MHz
D-MAC	25/50	4:3 or 16:9	625
	D-MAC	D-MAC	N/A
PALplus	25/50	16:9	625
	CCIR	PAL	4.43MHz
HiVision	60/120	16:9	1125
	HiVision	MUSE	Unknown

# NTSC – prednost i nedostaci

- Visoka frekvencija frame-ova: 30 (slika/s)
- Manje osnovnog suma u slici (takvi su svi bolovi u TV lancu NTSC-a)
- Kolor editovanje ne ometa boju

## **NEDOSTACI**

- Linjska struktura vidljivija zbog malog broja linija
- Mali opseg lumin. signala (tackasta struktura vidljivija)
- Osetljivost na promenu boje
- Mali gama odnos (manji kontrast u slici).
- Nepoželjni automatski efekti – autokorekcija promene tal. duzine boje (manje uocljivi flesh tonovi).

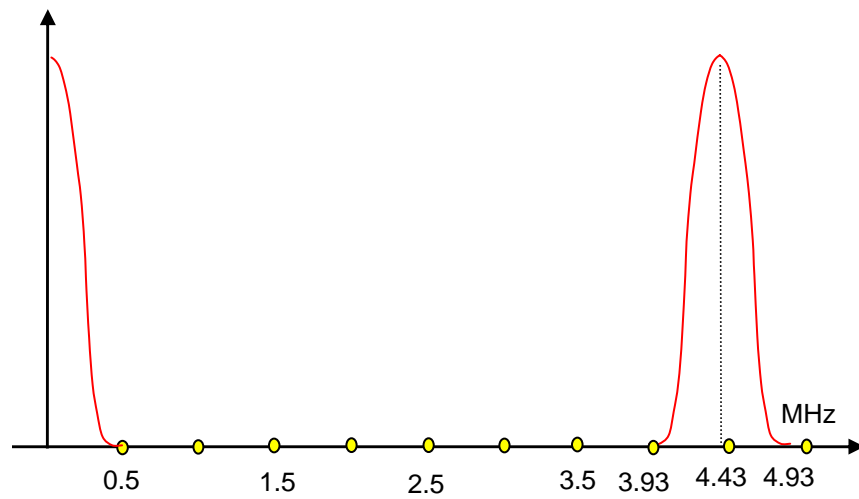
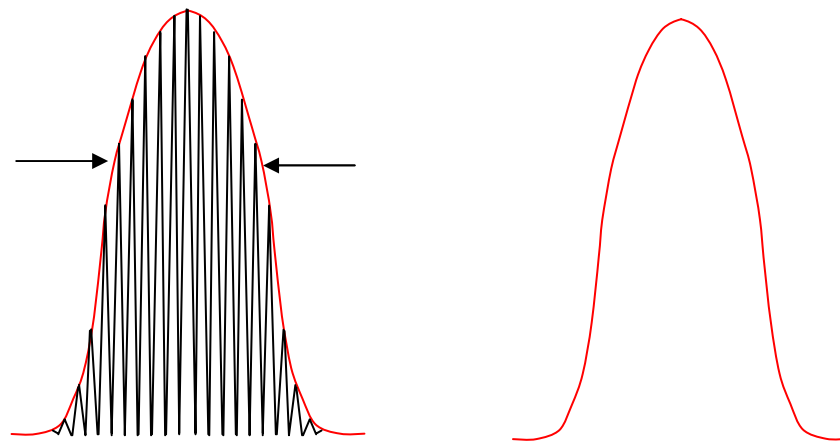
## PAL prednosti i nedostaci

- Veci broj linija
- Siri opseg lumin. signala,
- Stabilna boja (hue)
- Veci gama odnos – bolji kontrast,

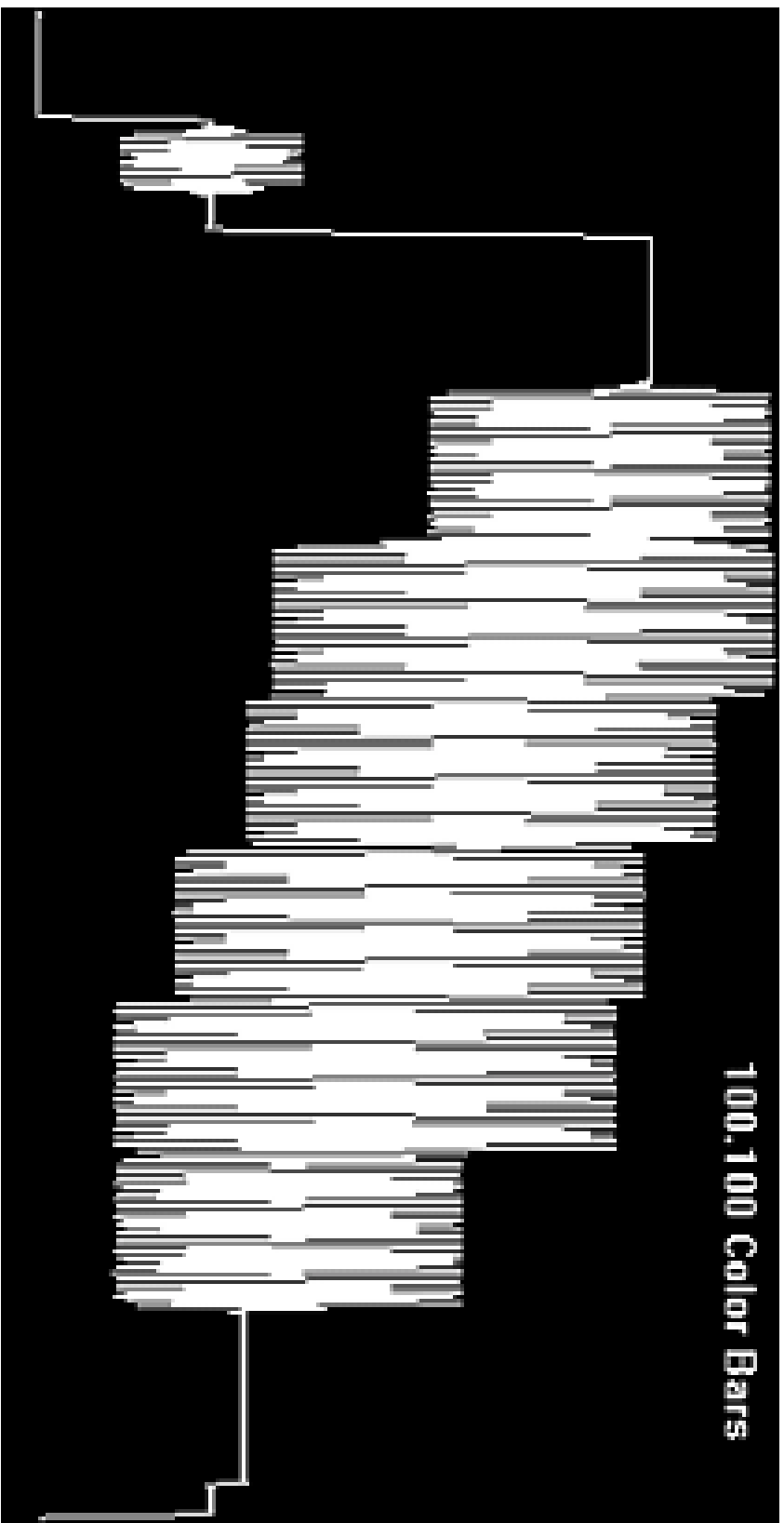
## NEDOSTACI

- Veci fliker,
- Manji odnos S/N
- Gubi se kolor preciznost u editovanju (zbog promene faze u susednim linijama)
- Promenljiva saturacija boje (zbog promene faze).

# Osnovni TEST signali



## 100.100 Color Bars



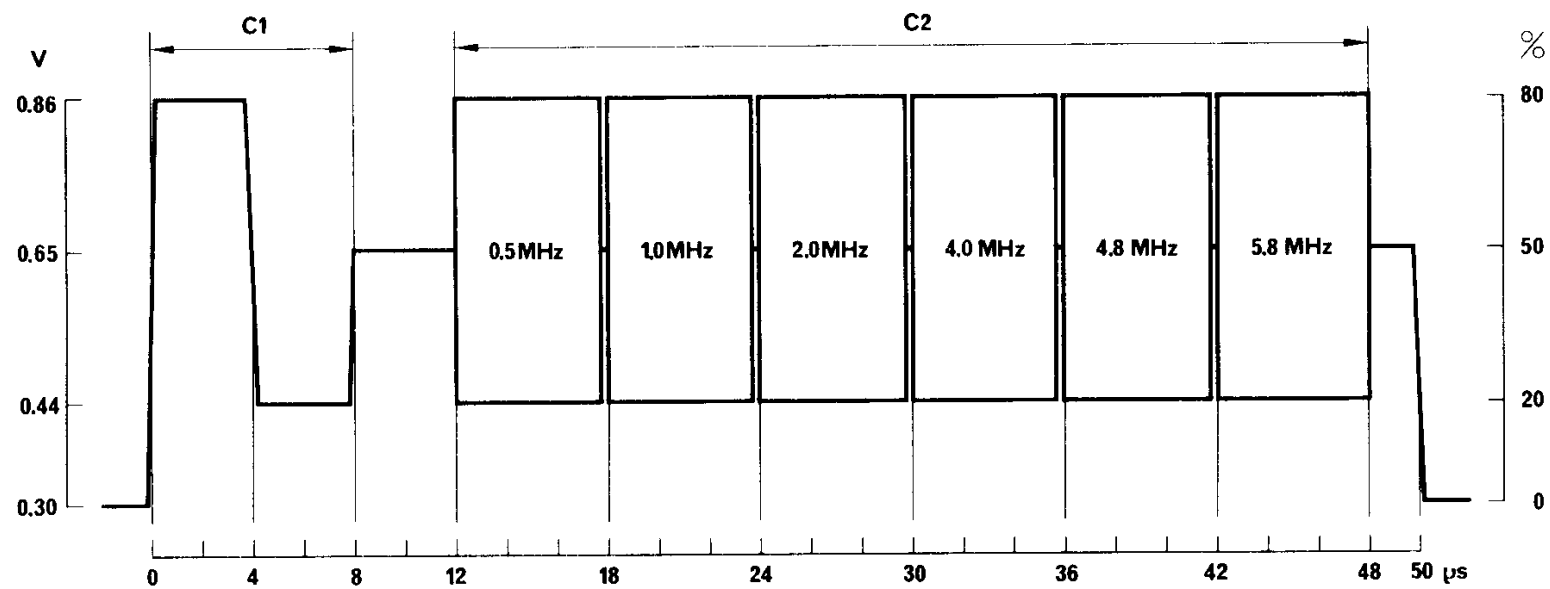


FIGURE 9 – *Signal C for 625-line systems*

*Note* — Some OIRT countries use 1.5 MHz and 2.8 MHz for the 2nd and 3rd bursts.

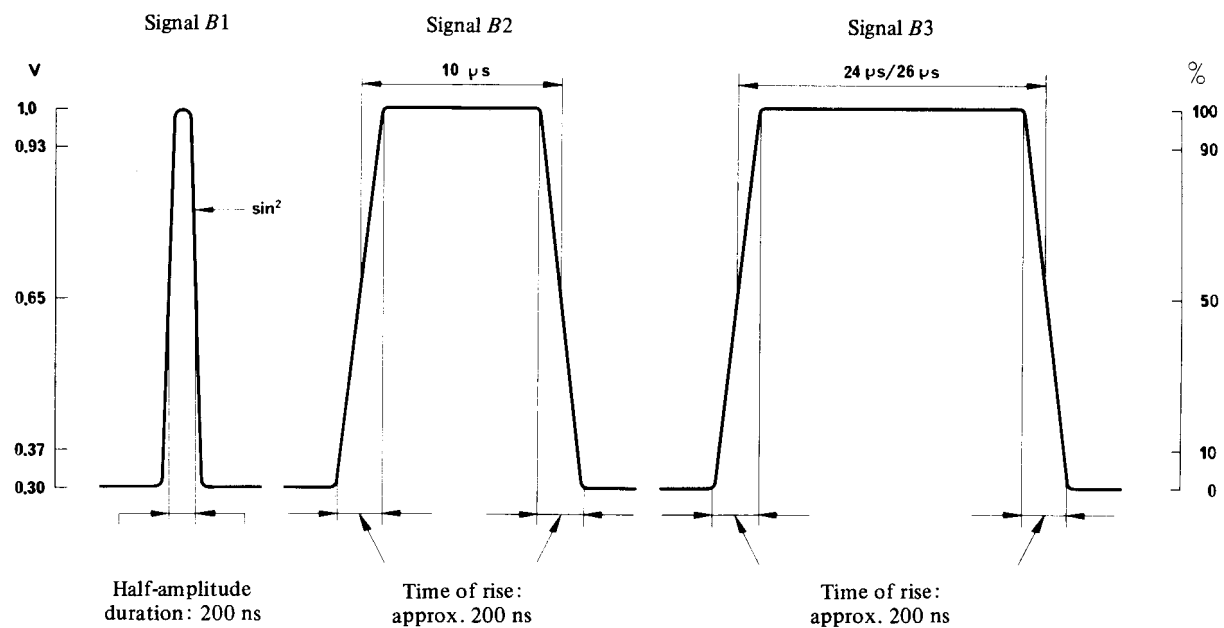
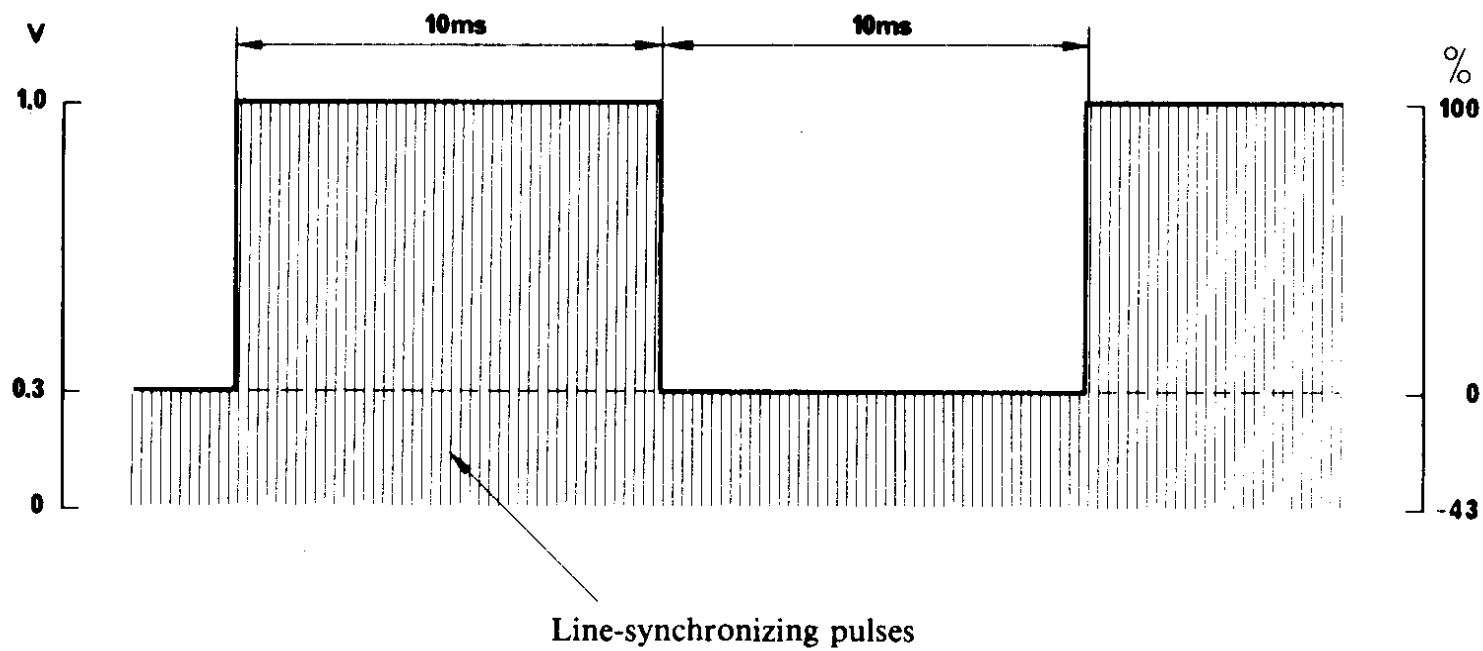


FIGURE 7 – *Signal B for 625-line systems*

*Note 1* — In some OIRT countries, a half-amplitude duration of 160 ns is used for *B1* and a time of rise of 80 ns for *B2*.

*Note 2* — In France, the normal time of rise of *B2* and *B3* is approximately 110 ns.





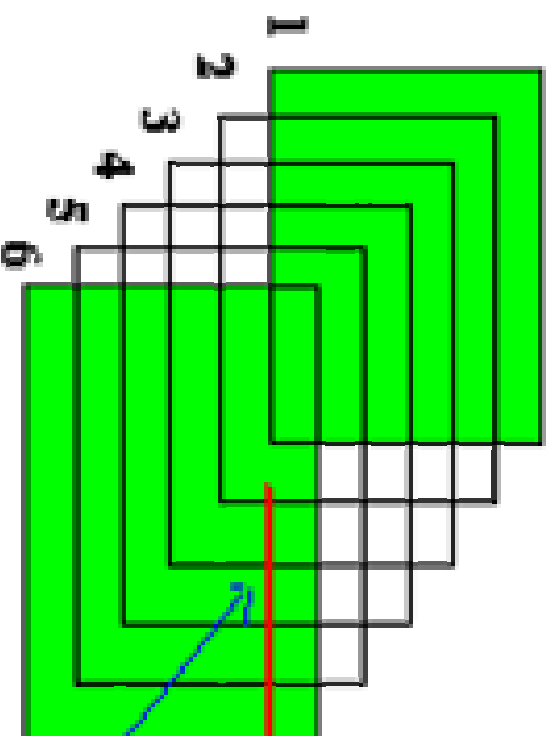
**FIGURE 5 – *Signal A for 625-line systems***

*Note* — This signal may contain field-synchronizing pulses.

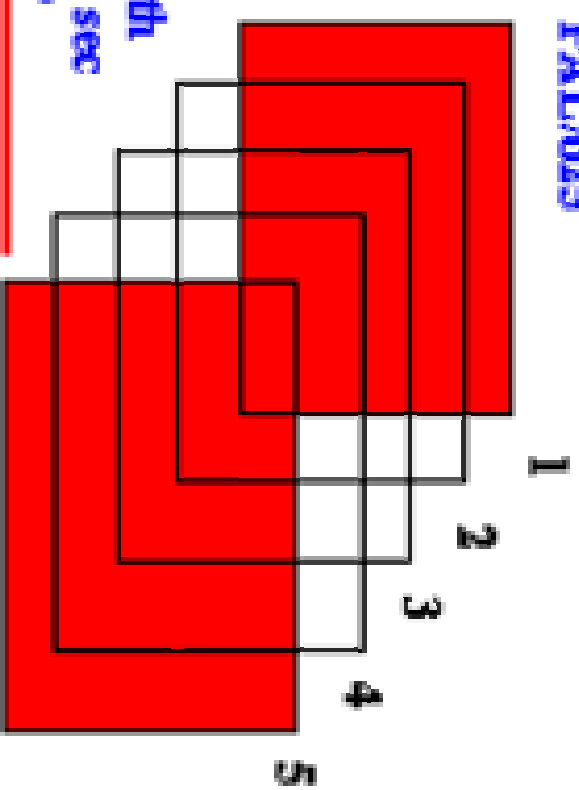
d06-sc

Konverzija standarda

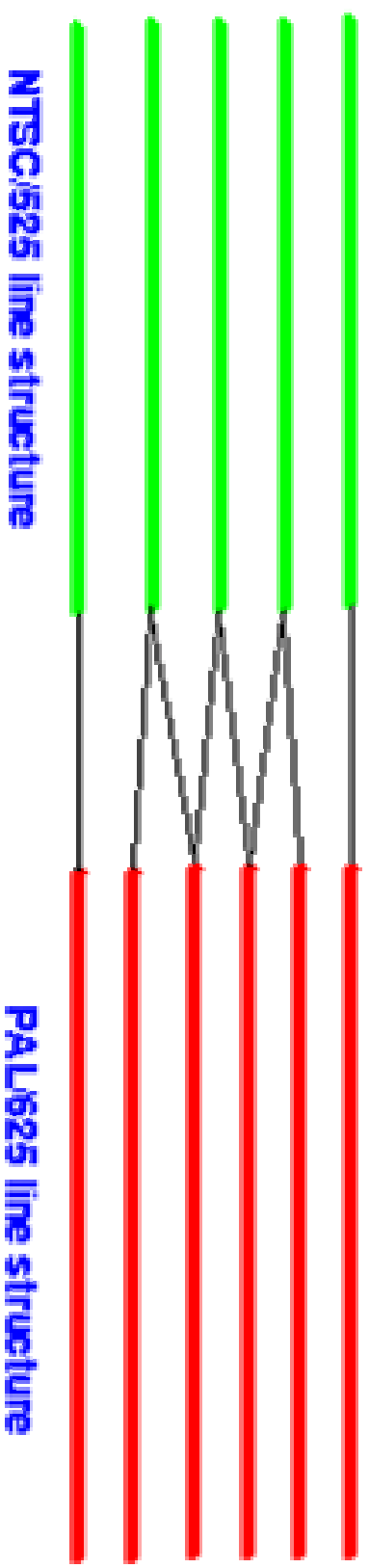
**NTSC/525**

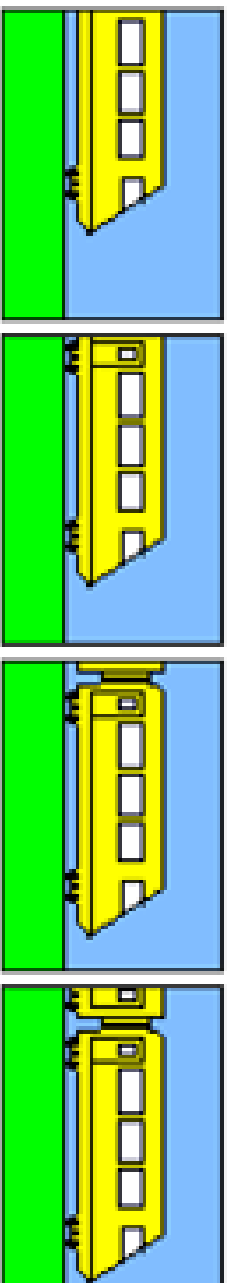


**PAL/625**

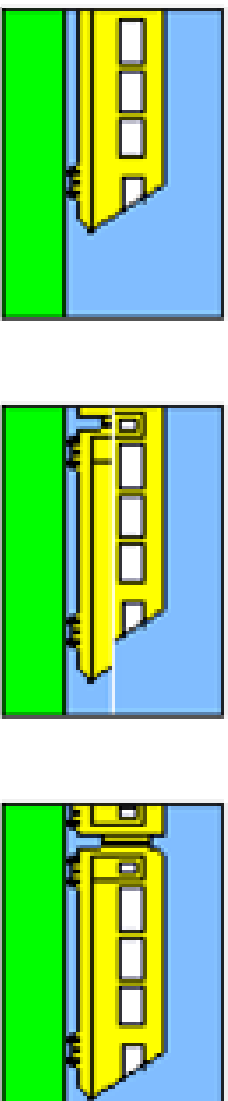


**Illustration of the difference in frame rate between NTSC/525 and PAL/625 over the period of 1/5th of a second.**

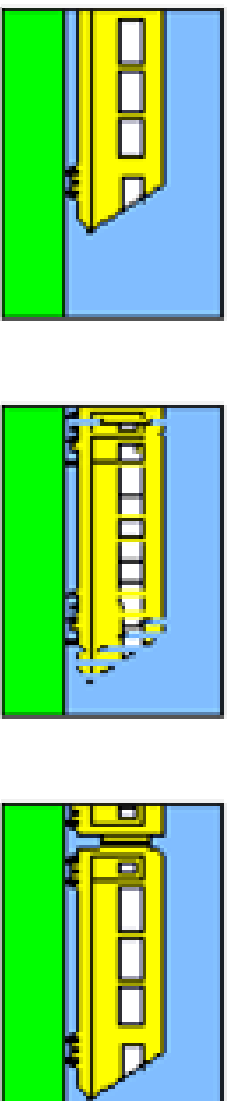




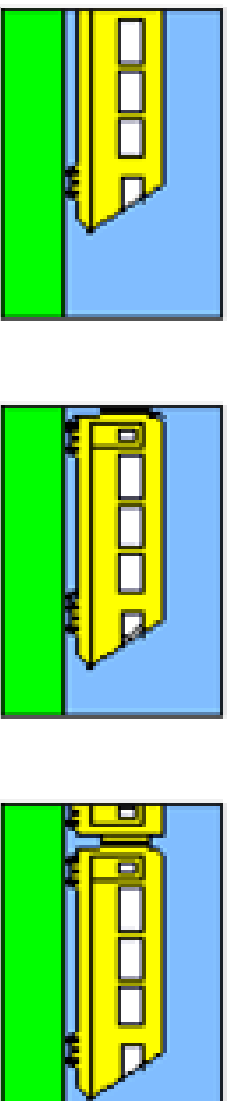
**Original  
Sequence of  
4 Frames**



**Method A**  
When input frame  
point passes output  
point, image changes



**Method B**  
Intermediate frame  
is made by mixing  
input two together



**Method C**  
Motion Tracking  
attempts to create  
in-between image

## Examples of Motion Handling in TV Standards Conversion

# Analogna TV

Irini Reljin