SLOVENSKI STANDARD
SIST EN 50083-5:1995

01-marec-1995

Kabelski distribucijski sistemi za televizijsko in zvokovno radiofuzijo - 5. del: Glavne sprejemne postaje - komponente

Cable networks for television signals, sound signals and interactive services -- Part 5: Headend equipment

Kabelnetze für Fernsehsignale, Tonsignale und interaktive Dienste-- Teil 5: Geräte für Kopfstellen

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Réseaux de distribution par câbles pour signaux de télévision, signaux de radiodiffusion sonore et services interactifs -- Partie 5: Matériels de tête de réseau

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Ta slovenski standard je istoveten z: **EN 50083-5:1994**

ICS:

33.060.40 Kabelski razdelilni sistemi Cabled distribution systems

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2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 50083-5

July 1994

UDC 621.397.743

Descriptors: Telecasting, cable television, sound broadcasting, television broadcasting, community aerial systems, characteristics

English version

Cabled distribution systems for television and sound signals
Part 5: Headend equipment

Systèmes de distribution par câble destinés aux signaux de radiodiffusion sonore et de télévision
Partie 5: Matériels de tête de réseau

Kabelverteilsysteme für Ton- und Fernsehrundfunk-Signale
Teil 5: Geräte für Kopfstellen

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

This European Standard was prepared by CENELEC Technical Committee TC 109, Cabled distribution systems for television and sound signals.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50083-5 on 1993-09-22.

The following dates were fixed :

- latest date of publication of an identical national standard	(dop)	1994-12-01
- latest date of withdrawal of conflicting national standards	(dow)	1994-12-01

For products which have complied with the relevant national standard before 1994-12-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 1999-12-01.

Annexes designated "normative" are part of the body of the standard. Annexes designated "informative" are given only for information. In this standard, annexes A, B, D and E are normative and annex C is informative.

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1. Scope

This standard defines the characteristics of equipment used in the headends of terrestrial broadcast and satellite receiving systems (without satellite outdoor units and without those broadband amplifiers in the headend as described in EN 50083-3). The satellite outdoor units for FSS are described in standard ETS 300 158, for BSS in standard ETS 300 249. This standard does not relate to subscriber equipment, such as receivers, tuners, decoders, video recorders, etc.

This standard

- covers the frequency range 5 MHz to 1750 MHz
- identifies performance requirements for certain parameters
- lays down data publication requirements for certain parameters
- stipulates methods of measurements
- introduces minimum requirements defining quality (Q) grades.

As far as possible this standard only deals with the interfaces between headend components and only explains the function of the devices if this is necessary to support the description of the interfaces.

Coder, transcoder, encrypter, decrypter etc. are not described in this specification. If such devices are used in headends, the relevant parameters for RF, video, audio and data interfaces have to be met.

According to the definitions in clause 2 the headends are divided into the following three quality levels:

grade 1 - local headend / remote headend
grade 2 - hub headend
grade 3 - MATV headend / individual reception headend

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Practical experience has shown these types meet most of the technical requirements necessary for supplying a minimum signal quality to the subscribers. This classification shall not be considered as a requirement but as the information for users and manufacturers on the minimum quality criteria of the material required to install networks of different sizes. The system operator has to select appropriate material to meet the minimum signal quality at the subscriber's outlet and to optimize cost performance, taking into account the size of the network and local circumstances.

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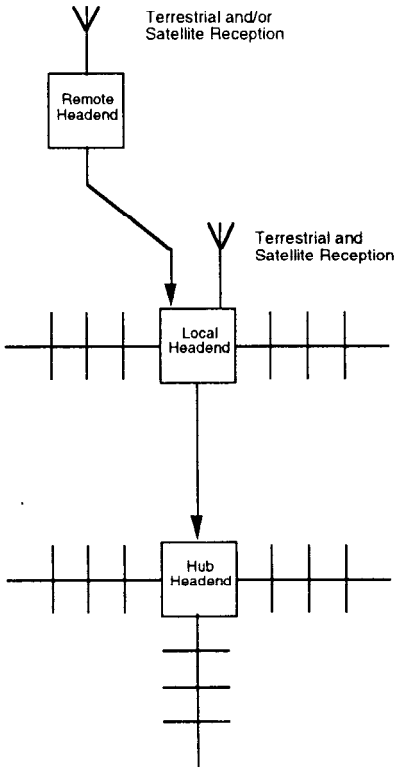

Figure 1: Example of headends

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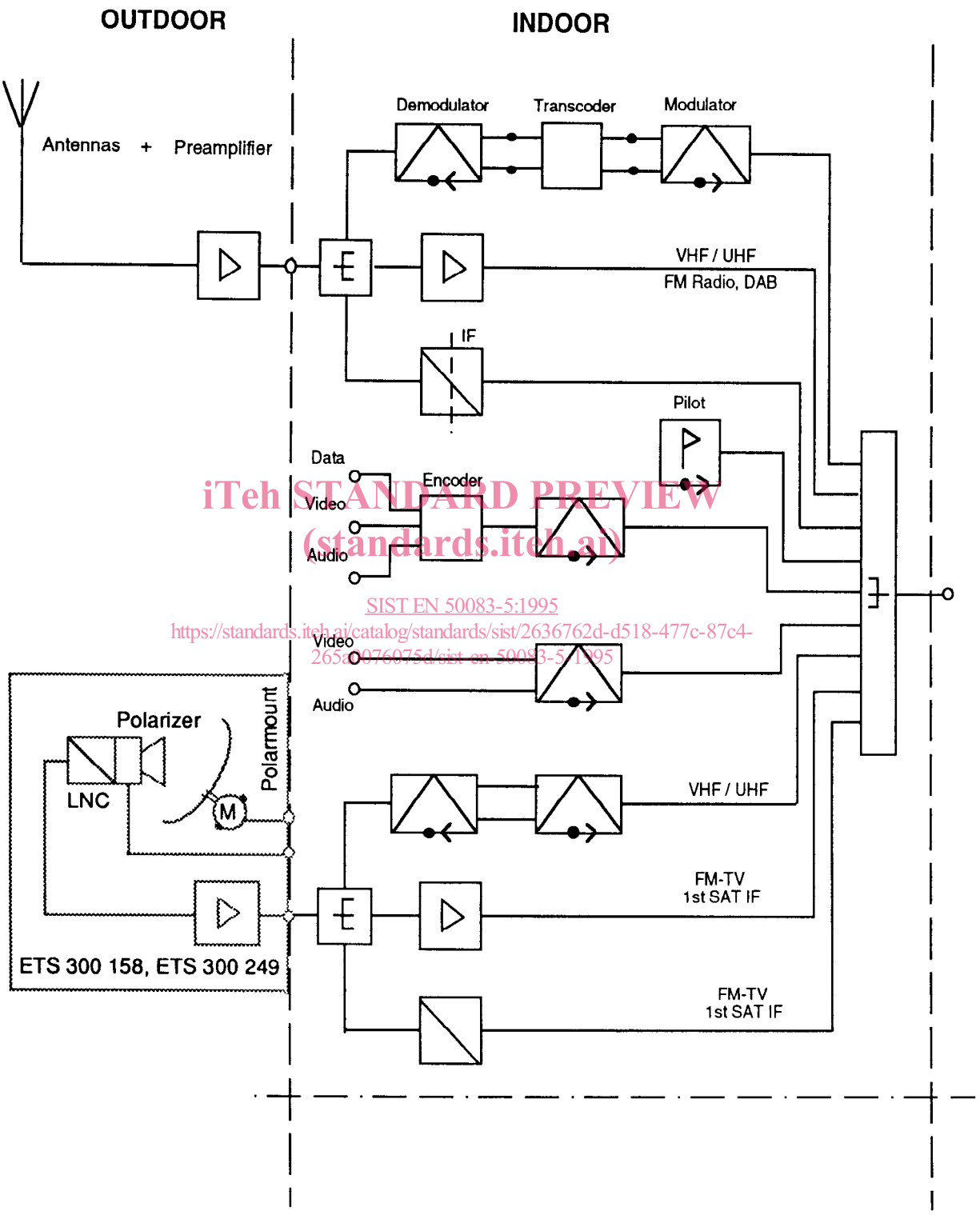

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Figure 2: Example of headend

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2. Terms and definitions

For the purposes of this standard the following definitions apply.

2.1 headend

Equipment which is connected between receiving antennas or other signal sources and the remainder of the cabled distribution system, to process the signals to be distributed.

NOTE: The headend may, for example, comprise antenna amplifiers, frequency converters, combiners, separators and generators.

2.2 hub headend

A headend used to feed the entire operating network in the service area.

2.3 local headend

A headend which is directly connected to the system trunk feeders or to a short haul "trunk feeder replacement" link.

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2.4 remote headend

A headend from which signals are delivered to a local headend via a long-distance terrestrial link.

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2.5 MATV headend

Headend used in blocks of flats and in built-up sites to feed TV channels and FM radio channels into the house network or the spur network.

2.6 SMATV - satellite master antenna television system headend

A headend where only IF signals supplied by the satellite antenna outdoor unit are inserted into the distribution network either as individual signals or together with the terrestrially received signals. If the TV signals received from the satellite are remodulated into an AM-TV format, the term "SMATV headend" shall not be used. Use instead "hub headend", "local headend", "remote headend" or "MATV headend".

2.7 headend for individual reception

A headend supplying an individual household. This type of installation may include one or more system outlets.

2.8 antenna preamplifier

An amplifier (often a low noise type) associated with an antenna.

2.9 frequency converter

A device for changing the carrier frequency of one or more signals.

2.10 combiner

A device in which the signals arriving at two or more input ports are fed to a single output port.

NOTE: Some forms of this device may be used in the reverse direction as splitters.

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2.11 decibel ratio

Ten times the logarithm of the ratio of two quantities of power P_1 to P_2, i. e.

$$10 \lg \frac{P_1}{P_2} \text{ (dB)}$$

2.12 standard reference power and voltage

In cabled systems the standard reference power P_0 is 1/75 pW.

NOTE: This is the power dissipated in a 75 Ohm resistor with a voltage drop of 1µV r.m.s. across it.

The standard reference voltage U_0 is 1 µV.

2.13 level

The level of any power P_1 is the decibel ratio of that power to the standard reference power P_0, i.e.

$$10 \lg \frac{P_1}{P_0}$$

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The level of any voltage U_1 is the decibel ratio of that voltage to the standard reference voltage U_0, i.e.

$$20 \lg \frac{U_1}{U_0}$$

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This may be expressed in decibels (relative to 1 µV in 75 Ω) or more simply in dB(µV) if there is no risk of ambiguity.

2.14 image carrier power

"Power", in relation to a vision-modulated carrier, is defined as the power at the peak of the modulation envelope (i.e. the maximum r.m.s. voltage squared, divided by the resistance).

2.15 attenuation

The ratio of the input power to the output power of an equipment or a system, usually expressed in decibel.

2.16 gain

The ratio of the output power to the input power of any equipment or system, usually expressed in decibel.

2.17 automatic gain control (AGC)

The automatic control of a device to maintain the level of the signal at its output constant, using the signal to be controlled as the control stimulus.

2.18 amplitude frequency response

The gain or losses of an equipment or system plotted against frequency.

2.19 intermodulation

The process whereby the non-linearity of equipment in a system produces spurious output signals (called intermodulation products) at frequencies which are linear combinations of those of the input signals.

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2.20 carrier-to-intermodulation ratio

The difference in decibels between the carrier level at a specified point in system or equipment and the level of a specified intermodulation product or combination of products.

2.21 carrier-to-noise ratio

The difference in decibels between the vision or sound carrier level at a given point in the system and the noise level at that point (measured within a bandwidth appropriate to the television or radio system in use).

2.22 well-matched

The matching condition when the error introduced by the mismatch of the equipment facing the DUT and that of the device under test (DUT) is acceptable. To calculate the maximum error, use the following formula:

$$\text{Maximum measurement error of the return loss} = -20 \cdot \lg \left| 1 \pm 10^{\frac{a_r - a_m}{20}} \right|$$

NOTE: The worst case condition occurs when the return loss of the DUT and of the test equipment are equal but have opposite phase, i.e. resonance occurs.

Ripple due to mismatch.

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$$a_{\text{ripple max.}} \approx 40 \cdot \lg \left[\frac{\left(1 + 10^{-\frac{a_m + a_r}{20}}\right)}{\left(1 - 10^{-\frac{a_m + a_r}{20}}\right)} \right] + 20 \cdot \lg \left[\frac{\left(1 + 10^{-\frac{a_m}{20}}\right)}{\left(1 - 10^{-\frac{a_m}{20}}\right)} \right]$$

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The first term describes the ripple due to the mismatch of the DUT at input and output, the second term gives the ripple due to mismatch between source and drain with reference to Z_0.
For simplicity this formula assumes that the test object has the same return loss value, a_r, at the input and the output. It is also assumed that the test units connected to the input and to the output have the same return loss value, a_m.

a_r = DUT return loss in dB
a_m = return loss of test equipment in dB

General information:

The return loss of the test equipment should be at least 10 dB better than the expected DUT value.

2.23 subscriber equipment

Equipment at the subscriber premises such as receivers, tuners, decoders, video recorders.

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3. Methods of measurement

3.1 Single-channel intermodulation

Specification for channel amplifier / frequency converter

Frequencies and levels of test carriers as shown in figure 3 simulate a colour television transmission where f_a, f_b and f_c respectively correspond to vision carrier, colour subcarrier and sound carrier. The most significant intermodulation products are:

$P3_f = f_a + f_b - f_c$

$P3_g = f_a + f_c - f_b$

The carrier levels for different television systems are given in table 1.

Table 1: Test signal levels in decibels relative to reference level

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Test signal \ System		B, G, H, I	L
Vision carrier	(f_a)	-8	0
Colour subcarrier	(f_b)	-17	0
Sound carrier	(f_c)	-10	0

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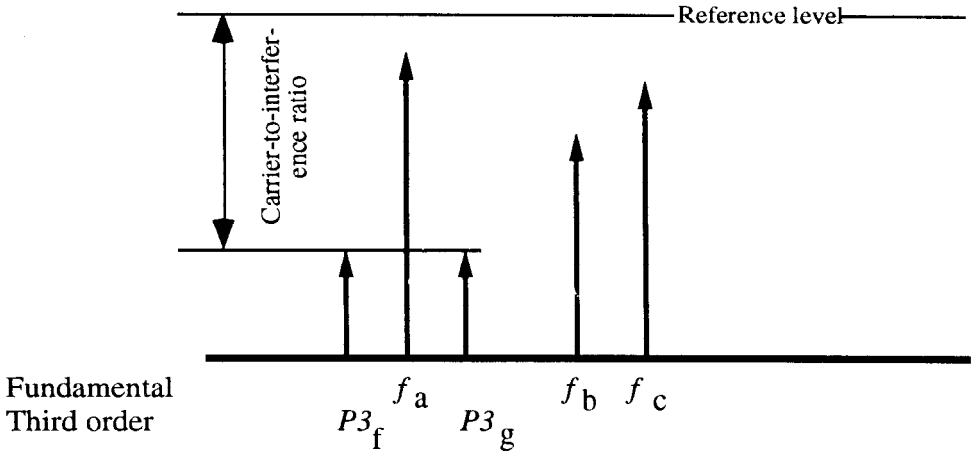

Figure 3

NOTE: Levels of measuring signals are to be adjusted as in table 1.

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3.2 Three-carrier intermodulation measurement

Specifications for the measurement of three-carrier intermodulation on sub-band, full-band and multi-band amplifiers or multi channel frequency converters.

In television band amplifiers the simultaneous transmission of multi channel programming may cause mutual interference between vision carriers through crossmodulation. The carrier-to-crossmodulation distortion ratio is defined as the difference between the level of a given test carrier and the level of the crossmodulation products produced by interfering signals and falling near that test carrier.
This method of measurement is used to simulate transfer of modulation between two television signals. The test carrier having the frequency f_a is an unmodulated wanted signal, while the carriers having the frequencies f_b and f_c represent the sidebands of a one-hundred percent amplitude modulated (AM) interfering signal.

Table 2: Test signal levels in decibels relative to reference level

Test signal	
Test frequency (f_a)	0
Interfering frequency (f_b)	- 6
Interfering frequency (f_c)	- 6

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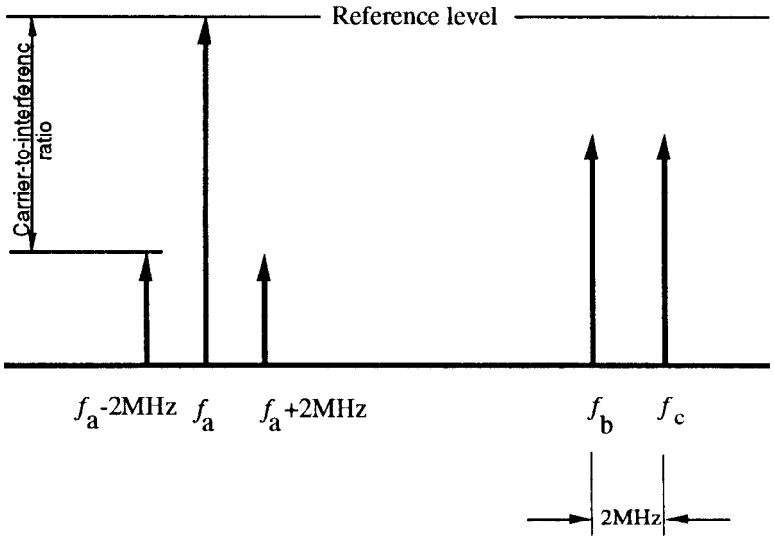

Figure 4: Test carrier and interfering products in the passband

The carriers having the frequencies f_a, f_b and f_c shall be varied over the entire frequency range.

NOTE: If the equal carrier method of measurement as described in subclauses 3.2.2 and 4.11.2 of EN 50083-3 is used, the output level giving the appropriate signal-to-distortion ratio must be increased by 6 dB.

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3.3 Two carrier intermodulation measurements for second and third order products

The two carrier method is applicable to the measurement of the ratio of the carrier to a single intermodulation product at a specified point within a cabled distribution system. The method can also be used to determine the intermodulation performance of individual items of equipment.

Second-order products are encountered only in wideband equipment and systems covering more than one octave, and can be measured using two signals.

Third-order products are encountered in both wideband and narrow-band equipment and systems and, depending on the type, can also be measured using two signals.

Intermodulation products with test signals at frequencies f_a and f_b

Second order (see note):	$P2_a$	=	$f_b - f_a$	
	$P2_b$	=	$f_a + f_b$	
Third order:	$P3_a$	=	$2f_a - f_b$	where $2f_a > f_b$
	$P3_a$	=	$f_b - 2f_a$	where $2f_a < f_b$
	$P3_b$	=	$2f_b - f_a$	
	$P3_c$	=	$2f_a + f_b$	
	$P3_d$	=	$2f_b + f_a$	

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NOTE : Not applicable to narrow band equipment unless the frequency range covered by the equipment is such that $2f_{min} < f_{max}$.

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Signal levels

The two test carriers shall be set to the reference level.

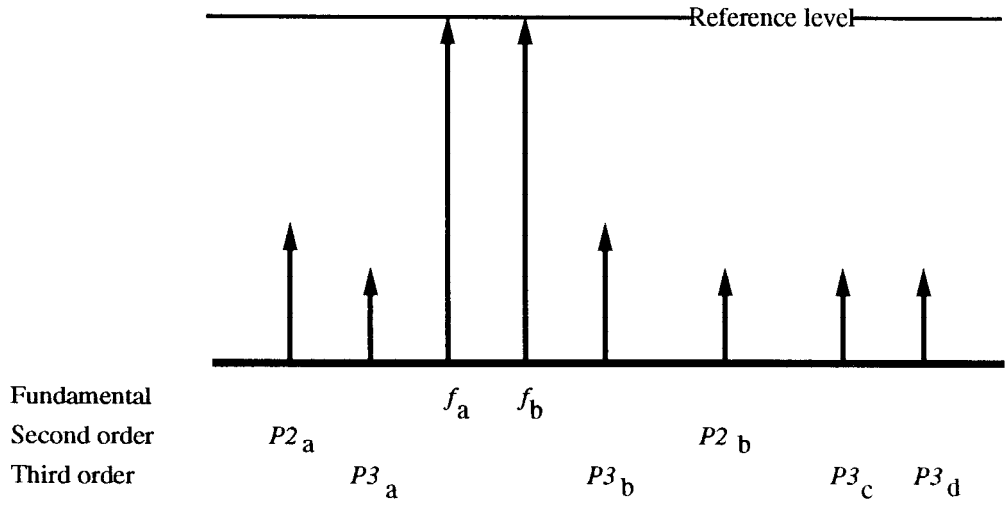

Figure 5: An example showing products formed when $2f_a > f_b$

NOTE : The sequence of the intermodulation products will depend on the fundamental frequency chosen.