Infra-red simultaneous interpretation system and its technology development and innovation

Summary

The infra-red simultaneous interpretation (IrSI) system is a language distribution system using infra-red radiation and has been widely used in various kinds of large multilingual international conferences to provide synchronous interpretation service. The traditional IrSI system compliant to IEC 61603 BAND II is subject to the interference of newly developed high-frequency-driven lightings (i.e. compact fluorescent lamps) which is becoming the mainstream in lighting market all over the world due to its energy-saving features associated with high performance-cost ratio. However, the IrSI system complying with IEC 61603 BAND IV has perfect interference immunity to the high-frequency-driven lights and is certain to be the preferred system in the market.

Part 1: Infra-red simultaneous interpretation (IrSI) system

The IrSI system, typically using infra-red radiation in the range of wavelengths from 830nm to 950nm to distribute multiple interpretations, is an indispensable auxiliary voice system in modern multilingual international conference.

The IrSI system has many advantages: first, the radiation using IR modulation has high privacy (since it’s unable to pass through opaque structures such as walls, the conference venue itself acts as a barrier to infra-red escaping and be overheard); second, it is immune to the interference from free air electromagnetic waves and industrial equipment. Meanwhile, infra-red radiation has relative wider bandwidth in information transmission. All of these make it prevalent in current market of wireless language distribution system.

International standard IEC 61603-1(reference document 1) recommends using BAND II (45kHz~1MHz) and BAND IV (2MHz~6MHz) for audio and related signals transmission systems, as Figure 1:

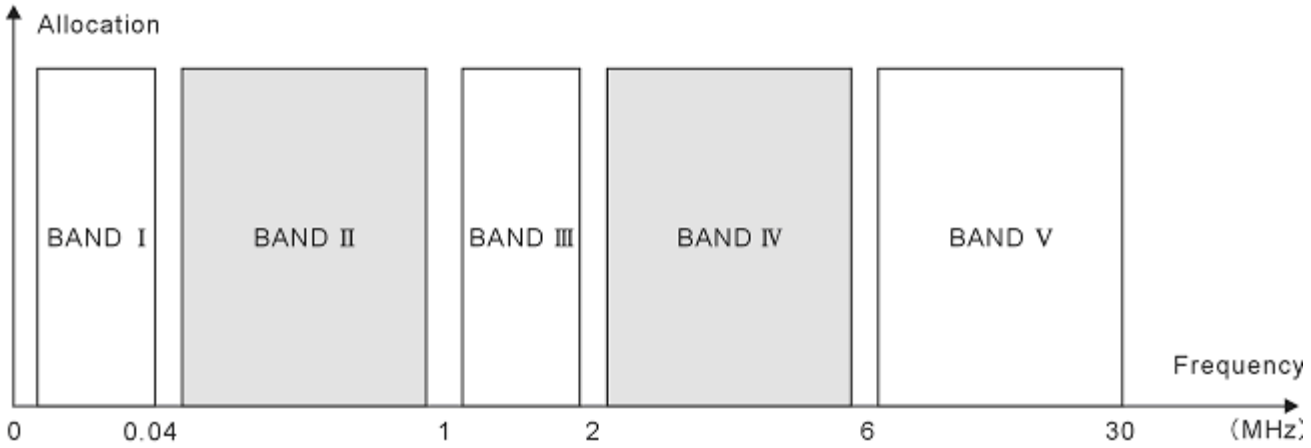

Figure 1: Preferred electrical spectrum allocation for IR modulation

BAND II (45 kHz~1MHz): Audio wideband and related signals transmission for conference and similar systems/ Audio transmission for conference and similar systems/ Low-speed remote control systems

BAND IV (2MHz~6MHz): Audio wideband and related signals transmission systems

Part 2: IrSI system using BAND II spectral band

In 1976, German BRAHLER ICS developed the first IrSI system - BRAHLER IRX in the world(reference document 2). The system complies with int. standard IEC 61603-2 standard(reference document 3) : the working band mainly falls into the BAND II (45kHz~1MHz), and with an extended band ranging from 1015kHz to 1335kHz which partly covers the BAND III for extended operation. It employed subcarrier FM with frequency deviation of ±7.5kHz, and was designed to receive up to 31 audio channels in the entire working band with a step of 40kHz (Table 1 lists the specific subcarrier apportion). The maximum system frequency response and signal-to-noise ratio reached 125Hz~8kHz and 50dB respectively.

Channel	CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11	• • •
Frequency (kHz)	55	95	135	175	215	255	295	335	375	415	495	535	• • •

Table 1: Subcarrier frequency apportion based on IEC BAND II

From then on, almost all manufacturers of IrSI system in the world employ IEC BAND II spectral band in their relevant products, such as SX-2130 (55kHz~900kHz, SONY, Japan), IR15 (55kHz~655kHz, DIS, Denmark), HDI1029

(55kHz~695kHz, SENNHEISER, Germany), LBB3434 (55kHz~1335kHz, PHILIPS, Netherlands), and HCS-834 (55kHz~900kHz, TAIDEN, China), etc.

As mentioned before, the IrSI systems using BAND II are subject to the interference of newly developed high-frequency-driven lights (i.e. energy efficient lamps), which not only interfere with the 45kHz to 250kHz range and its harmonics and subharmonics, but also generate modulated IR signals mainly concentrated at the MHz range which just fall into the range of subcarrier frequency band (45kHz~1MHz) of BAND II, thus the impairment to the sound quality and transmission distance of infra-red radiation system caused by the HF-driven lights is inevitable and shouldn't be neglected. (Figure 2, reference document 1 & 4)

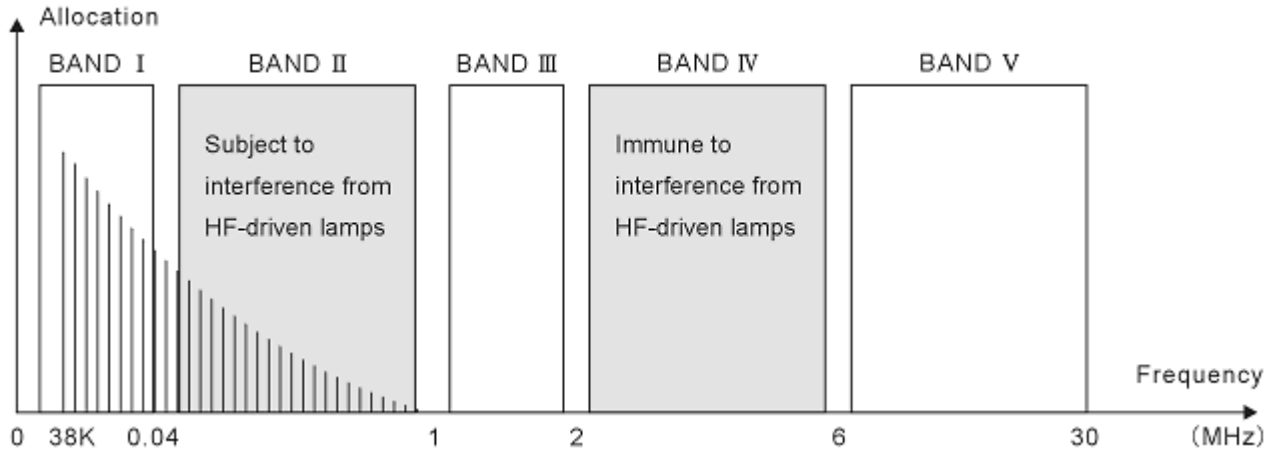

Figure 2: The principle of interference caused by HF-driven lights of IrSI system

Generally, in order to maintain normal functions of the IrSI system, certain manufacturers do not recommend to use the IrSI system complying with BAND II in the conference venue where high-frequency-driven lights are installed in system instructions(reference document 5).

Part 3: IrSI system using BAND IV spectral band

In 2001, TAIDEN Company (Shenzhen, China) innovatively developed the first IrSI system complying with standard IEC 61603 BAND4 (2~6MHz) in the world - HCS-826R. Compliant to IEC 61603-3 (reference document 4), TAIDEN HCS-826R employs infra-red subcarrier FM with frequency deviation of ±22.5kHz, while its entire transmission frequency covers from 2.05MHz to 5.15MHz; moreover, it's been designed to receive up to alternative 16/31 audio

channels within its working band in 200kHz steps (Table 2). Its maximum system frequency response and signal-to-noise ratio reaches 20Hz~12kHz and not less than 55dB respectively.

CH NO	CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11	CH12	CH13	CH14	CH15
Mhz	2.05	2.25	2.45	2.65	2.85	3.05	3.25	3.45	3.65	3.85	4.05	4.25	4.45	4.65	4.85	5.05
CH NO	CH16	CH17	CH18	CH19	CH20	CH21	CH22	CH23	CH24	CH25	CH26	CH27	CH28	CH29	CH30	CH31
Mhz	2.15	2.35	2.55	2.75	2.95	3.15	3.35	3.55	3.75	3.95	4.15	4.35	4.55	4.75	4.95	5.15

Table 2: Subcarrier frequency apportion based on IEC BAND IV

In 2003, PHILIPS (BOSCH) developed its first IrSI system working in the BAND IV spectral band -- Integrus(reference document6).

As working at the relative higher frequency (2MHz-6MHz), the IrSI system complying with standard IEC BAND IV has eliminated the interference from the high-frequency-driven lights. Furthermore, compared with traditional IrSI system using BAND II, the IrSI system working at BAND IV provides with wider frequency response, higher signal-to-noise ratio, and lower crosstalk distortion between channels, leading to perfect audio fidelity.

Part 4: Situations and prospects

The energy efficient lighting is the necessary trend in the field of lighting throughout the world, and it's also an indispensable way to save resources and protect the environment. The newly-developed compact fluorescent lamp is one of the most representative products in current lighting market with features such as energy-saving, long-product-life, and easy-to-use, etc. Many countries in the world have established policies, regulations or activities to popularize this kind of products, such as Green Lights Project in China. It's well-founded to believe that conference venues of various kinds will use energy efficient lights, therefore the IrSI systems adopting BAND IV with high interference immunity to HF-driven lights are sure to be prevalent in the future market. Correspondingly, the IrSI systems adopting BAND II will be gradually eliminated by the market. Some of main manufactures of IrSI system in the world are pressing on with technical development on this aspect.

Reference document:

1. Section 2.5.5.2 IEC 61603-1: 1997, Transmission of audio and/or video and related signals using infra-red adiation - Part 1: General

2. BRAHLER ICS advertising brochure (Bilingual version, Traditional Chinese/English), the Quadra Technic ICS Ltd

3. IEC 61603-2: 1997, Transmission of audio and/or video and related signals using infra-red radiation - Part 2: Transmission systems for audio wide band and related signals

4. IEC 61603-7: 2003, Transmission of audio and/or video and related signals using infra-red radiation - Part 7: Digital audio signals for conference and similar applications

5. Page 7, Infrared data sheet (Pdf file), Philips Electronics N.V., 1998

6. Information Reports (Chinese, version 4, 2005), BOSCH Security Systems Ltd.

TAIDEN IR language distribution system

Transmit main unit

IR receiver

IR power radiator

TAIDEN

CLOSE