RECOMMENDATION ITU-R SNG.1007-1*,**

Uniform technical standards (digital) for satellite news gathering (SNG)

(1993-1995)

The ITU Radiocommunication Assembly,

considering

a) that satellite news gathering (SNG) using portable transmitting earth stations is essential for broadcast operations and provides a valuable method of transmission for the rapid acquisition and broadcasting of news events;

b) that to facilitate the international coverage of news and to optimize the design of equipment, it would be desirable to adopt uniform technical standards for digital SNG, taking into account the possibility for interference to other satellites and systems and the need to be interoperable;

c) that digital SNG requirements include various communication and transmission support systems and that it is necessary to provide, preferably on the same satellite transponder, auxiliary signals for the operation of digital SNG earth stations;

d) that digital SNG earth stations operate mainly in the fixed-satellite service, and should comply with the relevant provisions of the Radio Regulations, and any relevant domestic regulations requirements;

e) that digital SNG transmissions should conform to certain technical criteria with regard to off-axis e.i.r.p. and other antenna characteristics;

f) that the technical characteristics of an appropriate identification signal should be specified;

g) that digital SNG video terminals could require less transmission power and can use smaller antennas and lighter equipment than analogue SNG video terminals;

h) that digital SNG video terminals could utilize less power and bandwidth from the satellite;

j) that digital SNG transmissions have lower interference potential than analogue transmissions,

recommends

1 that digital SNG earth-station transmissions should comply with the uniform technical standards as described in Annex 1;

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* This Recommendation should be brought to the attention of Radiocommunication Study Group 6.

** Radiocommunication Study Groups 4 and 9 made editorial amendments to this Recommendation in 2001 in accordance with Resolution ITU-R 44 (RA-2000).

2 that digital SNG earth stations equipped to provide two-way satellite communications circuits should comply with Recommendation ITU-R SNG.771.

ANNEX 1

Technical parameters applicable to digital SNG terminals

1 General performance

A digital SNG terminal must be able to be rapidly deployed, to transmit (with a minimum of impairments) vision and associated sound or sound programme signals, to provide limited receiving capability to assist in the pointing of the antenna and to monitor (where possible) the transmitted signals, and to provide two-way communications for operation and supervision.

Digital SNG terminals using a flat (usually phased array antenna) or parabolic antenna consist of the following main units:

– antenna and feed system with polarization adjustment,

– antenna mount with azimuth/elevation adjustment,

– optional antenna tracking system. (In the case of a flat antenna automatic tracking may be achieved by use of a beacon signal. The satellite uplink and downlink contours must overlap. In the case of a loss of the beacon signal, specific procedures should be initiated in order to avoid interference to other systems),

– high power amplifier/solid state power amplifier (HPA/SSPA) for multiplexed vision/-sound/data channels,

– receiver unit in order to assist antenna pointing,

– baseband/coding and modulation equipment and IF to RF upconverter,

– two-way communication equipment for voice/data,

– system local/remote control panel,

– optional power generator.

2 Transmission performance requirements

The baseband digital signal shall be transmitted with a minimum of impairment by adhering to the performance requirements as described in § 3.

3 RF performance requirements

3.1 Off-axis e.i.r.p. density

Shall comply with Recommendation ITU-R S.524 or the satellite operator's requirements, whichever is more stringent.

3.2 Polarization discrimination

Some satellites use overlapping channels with orthogonal polarization discrimination. The cross-polarization design for linearly polarized antennas should be better than 30 dB within the –1 dB points of the main axis of the beam and 25 dB elsewhere.

3.3 e.i.r.p.

The necessary e.i.r.p. of the digital SNG terminal depends on the required uplink carrier-to-noise ratio C/N and satellite G/T. However, e.i.r.p. is often limited by the off-axis e.i.r.p. density limits as indicated in § 3.1.

3.4 Necessary RF bandwidth

The necessary RF bandwidth for digital SNG can be determined by taking into account the RF spectrum of the digital signal and the number of associated carriers for auxiliary circuits.

3.5 Out-of-band e.i.r.p. density

The system should be designed with a sufficient output back-off of the amplifier in order to limit the out-of-band emissions due to the output amplifier non-linearity.

The exact limit for the permitted out-of-band e.i.r.p. density is determined by the satellite operator.

4 Modulation characteristics

The modulation of the carrier with the multiplexed vision, sound and auxiliary data signal shall be fully compatible with the specifications as defined below.

The main characteristics are:

– coherent QPSK modulation (other modulation methods may be used),

– FEC convolution encoding,

– soft decision decoding, e.g. Viterbi,

– optional outer coding,

– scrambling of data for energy dispersal.

5 Range of bit rates

SNG is primarily a contribution link, and as such, the integrity of the original source signal must be maintained throughout the satellite link. For contribution quality, at least 34 Mbit/s is recommended (see ITU-T Recommendation J.81).

It is also desirable to minimize the number of coding/decoding processes. Where possible, large bit rate reduction should be avoided at the beginning of the chain in order to enable good overall performance.

The use of lower bit rates (e.g. MPEG-2, main profile at main level) will allow small terminals, and will allow to operate them with low power. Equipment with variable or adaptive transmission bit rates can optimize operating conditions. In such cases, the system can be optimized to allow for the best operating conditions depending on external conditions such as rain attenuation and power limitations.

The same precautions should be taken for the audio signals.

6 Identification signal

Transmitted by suitable means (method to be further studied).

7 Antenna and feed system

The antenna should be small in diameter, light weight, easy to assemble and easy to transport.

The antenna radiation patterns in the plane of the orbital arc at the earth station location are such that the off-axis radiation will comply with § 3.1. The cross-polarization discrimination shall comply with § 3.2.

Repeated assembly and disassembly of the antenna shall not affect the radiation and cross-polarization discrimination performance.

8 Beacon signal

Flat antennas using electronic tracking techniques rely on the presence of an appropriate stable beacon signal.

9 **Auxiliary communications** (see Recommendation ITU-R SNG.771)

Digital SNG uplink signals are often originated from remote areas. In these cases, communication using the public switched telephone network (PSTN) is difficult or impossible. The digital SNG terminal should therefore be equipped to provide all of its own communications through the satellite to both the satellite operator's communication control centre and the broadcaster's premises, with the following facilities:

– *between digital SNG terminals and the satellite operator's communication control centre:* a minimum of one, two-way narrow-band, voice/data communication circuit. This should be available at all times and not be restricted to the transponder booked times. It is desirable that these circuits are provided in the same transponder as the programme vision and sound;

– *between the digital SNG terminal and the broadcaster's premises:* it is desirable to have four (4) two-way, narrow-band, voice/data communication circuits. These circuits should be available for a short time before and after as well as during the transponder booked times. It is essential that these circuits are provided in the same transponder as the programme vision and sound.

9.1 Communication channels for supervision and coordination

Digital SNG terminals require two-way communication channels, in addition to the vision and associated sound, to provide for communications capability with satellite operator's communications control centre and the broadcaster's facilities.

The digital SNG terminals are assumed to be located in the downlink footprint.

If the digital SNG terminal is not in the downlink footprint, other solutions, as described in Annex 2 to Recommendation ITU-R SNG.771, are required.

It should be noted that several domestic systems are presently in operation using various communication techniques.

9.2 Circuits between digital SNG terminal and satellite operator

Liaison with the satellite operator's communications control centre should be available at all times and should not be restricted to the duration of the transponder booking. For this purpose it is desirable that coordination circuits, in each direction, be provided preferably in the same transponder as the programme vision and sound.

If it is necessary to provide these carriers elsewhere on the satellite, and linear polarization is being used, they should be provided on the appropriate polarization to avoid the need for a dual polarization feed on digital SNG terminals.

9.3 Circuits between digital SNG terminal and broadcaster's premises

For the purpose of communicating with the broadcaster's premises, typically up to four (4) two-way (duplex) voice/data circuits are required per broadcaster. These circuits generally operate for brief periods before and after transponder bookings and during actual programme transmissions.

These "two-way" circuits between the digital SNG terminal and the broadcaster's premises could be used for:

– production coordination,

– engineering coordination,

– programme-related data transmission,

– more than one broadcaster,

– more than one language.

10 Video/audio/RF monitoring equipment

To allow the digital SNG terminal operator to properly set up the terminal, monitoring equipment is essential. To simulate the satellite transponder it is advantageous to provide a loop-test translator and video/audio receiver to verify the performance of the uplink equipment.

Due to the low G/T of the digital SNG antenna system and the particular operational configuration of the satellite system, it is normally not possible to monitor the transmitted video and audio signals at full quality. However, G/T should be adequate for communication channels.

11 Other design considerations

The digital SNG terminal can be designed with all the equipment next to the antenna or with the high power amplifier/solid state power amplifier (HPA/SSPA) at the antenna and the other equipment located some distance (e.g. less than 50 m) away from the antenna. The latter option, which is operationally preferable, allows the digital SNG terminal to be operated and monitored from indoors after antenna alignment.

The HPA/SSPA must be located as close as possible to the antenna to minimize the waveguide losses.

The system should be designed to accept redundant radio-frequency power amplifiers.

System interconnections must be reduced to a minimum to allow quick and easy set-up under all weather conditions, all external connections must be waterproof.

It is desirable that the digital SNG terminal can accept a power input of 100-250 V/50-60 Hz.

The design of the shipping cases should allow the terminal to be operated in direct rain with the lids removed. The cases must provide a controlled environment for the electronics to allow proper operation during extremes of both high and low temperatures.

The digital SNG terminal must be designed to offer the maximum possible safety to the operator.

12 Additional technical parameters

Considerations on pointing accuracy, polarization plane alignment and spurious emission are to be developed.

12.1 Digital SNG terminal using a flat antenna equipped with electronic tracking facilities

The small SNG terminal using a flat antenna is designed for easy portability, rapid deployment and prompt activation. By receiving a beacon signal transmitted via satellite by a “hub” station, it is only necessary to orient the flat antenna to within only a few degrees (for example: less than about 5°) of the satellite’s orbital position at which point the system automatically adjusts for optimum orientation and polarization alignment.