

1943  
1993

# HALF A CENTURY OF EXPERIENCE



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The Nagra era began 50 years ago. A half-century separates the first Nagra I professional recorder, which gave birth to the Nagra legend.

During the intervening period, Nagra Audio has developed and marketed a complete range of analog and digital tape recorders as well as, more recently, a line of audiophile products. The reputation of Nagra equipment is firmly established among audio professionals. Whether in the radio or cinema industries, Nagra products are always appreciated for both their sound quality and reliability. Equipment such as the Nagra 4.2 and the Nagra IV-S Time Code are seen as benchmarks in sound recording for cinema productions and are found on many film sets the world over. The performance of this equipment has been recognized with two Oscars® and two Emmy® Awards.

Renowned for their excellence throughout the world, the products of the Nagra Audio division demonstrate the Kudelski Group's commitment to its longstanding customers.

Today, the Kudelski Group is a world leader in the area of digital security, focusing on two main sectors: security of access to information (digital TV and broadband Internet) and physical access to sites. It is a leading provider of end-to-end conditional access solutions as well as related products and services to digital TV operators and content providers. It also offers access control solutions for public sites (car parks, stadiums, amusement parks, ski resorts) as well as highly secure smart-card-based physical access solutions for events.





1953 Nagra I



1955 Nagra II



1956 Nagra II CI



1962 Nagra III

## THE NAGRA STORY

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- 1953 **Nagra I** – Birth of the first portable recorder, the Nagra I. Stefan Kudelski, a physics student at what is now the Swiss Federal Institute of Technology, Lausanne, working at home in his spare time, built the first Nagra I portable, a self-contained audio recorder with a wind-up motor. Two Nagra I recorders, purchased by Radio-Geneve, were taken on the Everest expedition led by Raymond Lambert. Professor Augustin Piccard used another during his deep-sea dives in the bathyscaph "Trieste" in Castellamare di Stabia, and the French radio station "Europe" acquired a machine for its news gathering campaign.
- 1955 **Nagra II** – An improved version of the Nagra I still using vacuum-tube based electronics, with the tape transport driven by a Thorens turntable motor, wound-up with a crank handle. It was also equipped with a modulation meter (or modulometer) on the left side.
- 1956 **Nagra II CI** – Identical to the Nagra II with the exception that the modulometer was incorporated in the front panel of the machine and the electronics were constructed for the first time on printed-circuit boards.
- 1962 **Nagra III** – A transistorized tape recorder with electronic servo-activated speed control, was launched. For the first time ever, a unit weighing only five kilograms could be relied upon to produce recordings of the same quality as those achieved by the best non-portable studio recorders.
- 1962 The Italian radio and television corporation (RAI) purchased around 100 Nagra III machines for the Summer Olympics in Rome. Kudelski was producing 480 recorders a year.
- Nagra SN** – The Nagra SN (Série Noire) prototype was developed in 1960 but not put into production until 1970, as the miniature components available at the time were too fragile. It used silicon transistors, dry tantalum capacitors and later, surface mounted device (SMD) technology, many years before this SMD technology was adopted by others. This pocket-sized miniature recorder was destined for army and police forces (developed especially for the United States government or, more precisely, the United States Army).



1977 "CREVETTE"



1969 Nagra IV-L

## 1951 1970

1951 Invention of the "NEOPILOT" system allowing the Nagra tapes to be locked during playback to the reference signal which guaranteed "Lip-Sync" for motion picture sound tracks. 5

1960 **Nagra III NP** – Version with "NEOPILOT" synchronization. The first film recorded using this new technology for the dialog and ambience music was "Orfeu Negro" by Marcel Camus, shot in Brazil during its carnival; it received worldwide success.

EGROTECHNICA (ITALY)  
CARTONA (BRAZIL)

1964 At this time, Stefan Kudelski's workshop was located in Paudex, to the east of Lausanne. A subsidiary was opened in Renens, and a large plot of land was purchased at Cheseaux-sur-Lausanne for the building of a new factory.

1965 ACADEMY OF MOTION PICTURE ARTS AND SCIENCES  
ADDRESS: 1600 N. YORK AVE. HOLLYWOOD, CALIFORNIA

1966 "**Crevette**" (prawn) – An instrumentation recorder designed to be installed inside torpedoes for the French Navy to measure ballistics of the torpedoes.

SOCIETY OF MOTION PICTURE AND TELEVISION ENGINEERS (SMPTÉ)  
1800 L. WALKER BLDG. WASHINGTON

1968 Stefan Kudelski's private company became Kudelski SA.

**Nagra IV** – Successor to the Nagra III, equipped with silicon transistors and tantalum capacitors, was launched. The Nagra IV-L incorporated the Pilot synchronization system for cinema. Compared to its predecessor, it presented great improvements in terms of both reliability and – thanks to the numerous accessories integrated into the recorder – optional additional plug-in circuits. The operating temperature range of this recorder was extended to  $-55^{\circ}\text{C}$ .

Kudelski SA moved into its new factory at Cheseaux-sur-Lausanne.



1955 Nagra SNN



1961 Nagra 4.2



1963 Nagra IV-S



1972 Nagra IV-S2



1973 Nagra IS

## 1970 1980

1955 **Nagra SNN** "body recorder" - Designed for dialog recording (in cinema applications it is placed "on the actor") and also for music recording. It provides two tape speeds of 1.5" and 3.75" per second and recording in full-track mono. It can also be fitted with a synchronization system to allow "Lip-Sync" operation in the film world.

1961 **Nagra 4.2** - A full-track mono recorder designed for radio, cinema and television applications, with three tape speeds of 3.75", 7.5" and 15" per second.

**Nagra IV-S** - The first stereo recorder designed for high quality music recording as well as cinema and television applications.

1963 **Nagra SJ** - For acoustic instrumentation use.

**Nagra SNS** - half-track mono recorder (slow-speed version of the Nagra SNN for voice recording).

### INFORMATION FILM PRODUCERS OF AMERICA

ALVIN H. BOHLEN, JAMES W. WILSON, TECHNICAL EXPERTS

1973 **Nagra IS** (Idioten Sicher = Fool-Proof) - An ultra-lightweight, single-speed recorder designed to be extremely simple to operate and aimed initially at the "In-the-Field" reporters market.

1974 **Nagra IS T** - Two-speed Pilot version was introduced.



1971 Nagra E



1973 Nagrafax



1976 Nagra II



1978 Nagra TRVR

1971 **Nagra E (Economy)** – single speed, single microphone recorder.

1973 **Nagrafax** – A meteorological receiver/recorder system, designed specifically for use by both commercial and private vessels, was introduced. This system became standard on-board equipment for ocean-going ships.

**Nagra SNST** – The Nagra SNST stereo version of the SN was introduced for law enforcement. This pocket recorder designed for stereophonic voice recordings is equipped with a single tape speed. It is fitted with an analog compression system, which – contrary to the Automatic Level Control (ALC) – does not reduce the dynamic range available; during replay the full signal is reconstituted using the DSP expander unit.

#### ACADEMY OF MOTION PICTURE ARTS AND SCIENCES

[PRAWO DO WZNIKŁYCH DLA DZIEŁ AUDIO I AKCESORIÓW](#)

1976 **Nagra TI** – This year saw the introduction of the Nagra TI instrumentation recorder, for the recording of noise and vibration. A twin-capstan machine for delicate tape handling, it was originally developed at the request of the British Navy.

#### ACADEMY OF MOTION PICTURE ARTS AND SCIENCES

[PRAWO DO WZNIKŁYCH DLA DZIEŁ AUDIO I AKCESORIÓW, KLASY \(4\) 980011020011](#)

1978 **Nagra TRVR** – A long-duration automatic logging recorder, was created.



1967 Nagra VPR-5



1967 Nagra JBR



1967 Nagra IV-S TC

## 1980 1990

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1981 **Nagra TA** – A small studio machine derived from the Nagra TI, principally designed for post-production work and telecine transfer synchronization in cinema and video applications, joined the product range.

1981 **Ampex/Nagra VPR-5** – Kudelski SA took its first step into video with a portable, professional-standard 1" C-format video recorder. An agreement with Ampex was signed for marketing the Ampex/Nagra VPR-5. These machines were developed by Kudelski SA and commercialized by Ampex of Redwood City (USA). They were used to record the Mexico Olympic Games.

**AUDIO ENGINEERING SOCIETY (AES)**

**GOLD MEDAL AWARD**

**SOCIETY OF MOTION PICTURE AND TELEVISION ENGINEERS (SMPTE)**

**GOLD MEDAL AND INTERNATIONAL GOLD MEDAL**

**AWARD INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE SWITZERLAND)**

**1980 CENTRAL MEDAL**

1981 This year saw the addition of the Nagra JBR, a body recorder, and the Nagra IV-S TC, the SMPTE/EBU version of the Nagra IV-S.

**Nagra JBR (Body Recorder)** – It was designed as a pocket-sized subminiature stereo voice recorder for the security industry. The JBR has no erase facility and no playback on-board, both of which serve to reduce electromagnetic radiation and power consumption. In order to render it undetectable, the bias frequency was chosen to be the same as that of a quartz watch (32,768 kHz). It records on proprietary cassettes and uses cable remote microphones and cable remote control.

**Nagra IV-S TC (SMPTE/EBU time code)** – A version allowing center-track time code to be generated and recorded. This system, already used in video applications, maintains perfect audio to picture synchronization. Equipped with a slide-out keyboard and LCD display, all time-code functions can be set and monitored.

**ACADEMY OF TELEVISION ARTS AND SCIENCES**

**1981 GOLDEN GLOBE AWARD FOR TECHNICAL ACHIEVEMENT**





1985 Nagra T-Audio TC



1985 Nagra PS-1



1987 Nagra RTU

1988 **Nagra T-Audio TC** – A time-code version of the Nagra TA, was developed to read IV-S TC tapes in the studio. 9

**Nagra PS-1** – A playback system for the cassettes of the subminiature Nagra JBR recorder was designed. It is equipped with a powerful time-base corrector to correct speed variations incurred during the recording process. It also allows many additional equalization and filtering operations, as well as fast winding.

**SM LOREN L. RYDER**

(VITA TECHNICAL AWARD FOR BEST SOUND EQUIPMENT DESIGN ACHIEVEMENTS WITHIN THE MAJOR MOTION PICTURE FILM INDUSTRY)

**PRIMETIME EMMY AWARDS**

FOR BEST PORTABLE RECORDERS

1988 Kudelski SA and Honeywell Inc. (USA) signed a cooperation agreement for the development of a rotating head data recorder (RTU) for instrumentation applications.

1988 Development began on the Nagra-D digital audio recorder.

**HONORARY MEMBERSHIP OF SMPTE (SOCIETY OF MOTION PICTURE AND TELEVISION ENGINEERS)**

- 1989 • Canal+ adopted Kudelski's access-control system for pay television. Canal+ decided to replace all of its decoders with the Decodex system, developed by Nagravision. This division of Kudelski SA was formed to be responsible for all pay-TV activities. Canal+ (Spain) adopted the Nagravision system during this year.



1992 Nagra-D



1995 Nagra Ares-C

## 1990 2001

1990 → The Nagravision system was adopted by the "Premiere" German TV channel.

### ACADEMY OF MOTION PICTURE ARTS AND SCIENCES

LONDON'S SANYER AWARD FOR OUTSTANDING CONTRIBUTIONS TOWARD THE ADVANCEMENT OF THE SCIENCES OF THE ARTS  
BRANCH OF THE MOTION PICTURE

Development of the Nagra-D 4-channel digital recorder, intended for the music and cinema industries, nears completion.

- 1991 → André Kudelski succeeded Stefan Kudelski taking over the leadership of the company, and was appointed president of Kudelski SA.
- The millionth decoder, built under license from Nagravision, left the factory.
- First million analog decoders sold.
- The company concentrated its activities on conditional-access television.

The Nagra-D development team was reinforced, and the first industrial prototype was completed.

- 1992 → Creation of Nagra+, a joint venture of Kudelski SA and Canal+.
- Nagra Kudelski GmbH (Munich) became a fully-owned subsidiary of Kudelski SA.
- Nagra Kudelski (GB) Ltd. (London) was formed.

**Nagra-D** – A 4-channel, 24-bit digital recorder, was officially launched at the AES exhibition in Vienna. The Nagra-D was designed to be the highest quality recorder ever built. Equipped with all the requirements of a modern digital location recorder and all the necessary synchronization options for post-production work. It was designed principally for feature film and CD mastering applications. It was the first battery-operated 4-channel portable digital recorder in the world.

The Nagra-D achieved many success stories in music and film applications.

- 1995 → First order (by EchoStar) for a Nagravision digital TV system, marking the arrival of Nagravision on the North American market.

**Nagra Ares-C** – Unveiled at NAB '95 in Las Vegas, the Nagra Ares-C is a portable solid-state, digital recorder. The Ares-C was primarily designed for radio reporting with on-board editing capabilities and built-in ISDN functions for data transmission. Simple, robust and lightweight, it offers quality digital recordings using credit card-sized PCMCIA cards as the support medium, in the place of traditional tapes.





1987 Nagra PL-P



1987 Nagra C-PP



1998 Nagra VPA



1998 Nagra D II



1998 Nagra SAGSTAR

# 1990 2001

- 1995 > 85% of sales are achieved in the pay-television sector.

1995 THE NATIONAL ACADEMY OF TELEVISION ARTS AND SCIENCES  
AWARD RECOMMENDATION ON EXCELLENCE IN THE DEVELOPMENT OF DIGITAL PAY-TV IN THE UNITED STATES

24-bit/96kHz digital recording is now achievable using the Nagra-D and external A/D and D/A converters.

- 1997 > Nagravision (digital systems) made a break through in Europe.
- > Digital pay-television became the company's core business sector.

1987 **Nagra PL-P** – Nagra made its debut into the high-end audiophile market with the battery-powered Nagra PL-P Vacuum Tube Phono & Line Preamplifier. It received the celebrated COTY (Component Of The Year) Award in Japan and was named the "Best Puriat Preamplifier" in the Best of the Best chart produced by the prestigious Robb Report.

**Nagra C-PP** – A powerful recorder/editor/CODEC was presented at the NAB '97 Convention – the Nagra C-PP is a companion product of the Nagra Ares-C.

Academy Award-winning sound recorded entirely on the Nagra-D.

- 1998 > Nagravision conquered the British cable TV market.
- > Creation of NagraStar (a joint venture between Kudelski and EchoStar) and of NagraCard, a fully owned affiliate dedicated to smart-card technology.
- > Nagravision delivered the first systems offering mixed pay-television/Internet solutions.

1998 **Nagra VPA** – High-end audiophiles benefit from the addition of the Nagra VPA – Vacuum Tube Power Amplifier. This amplifier combines the most sophisticated technology with the irreplaceable magic of two 845 triodes and gives a respectable power of 50 watts per channel.

- 1999 > Against a background of convergence between television and other digital content (Internet, games, MP3, HTML, etc), the Kudelski Group created the first broadband network encryption systems.
- > Creation of NagraID (smart-card production) and of MediaCrypt (fundamental encryption technology).
- > The company became a holding company.



1979 Nagra MPA



1999 Nagra Ares-P



1903 Nagra PL-L



2001 Nagra V

1999 **Nagra-DII** 4-channel 24-bit digital recorder – It provides the most stunning portable audio recording capabilities available for both music and cinema applications available today.

**Nagra SNST-R** - Especially designed for high-quality music recording, the Nagra SNST-R analog recorder is a true technological gem. A frequency response of 50 Hz to 15 kHz and its small size render it an ideal candidate for all portable, location or discreet recording applications.

**Nagra MPA MOSFET Power Amplifier** – It provides a true output of 250 watts RMS per channel and uses a revolutionary PFC (Power Factor Correction) power supply. It received the celebrated COTY (Component Of The Year) Award in Japan.

- 2000
  - The Kudelski stock was listed on the SMI (Swiss Market Index) and on the MSCI (Morgan Stanley Capital International) Index.
  - Investment in SportAccess (ticketing) and in Polirights (e-voting and cyber-administration).
  - The Group continued to expand in the field of secure distribution of digital content over broadband networks.

2000 **Nagra ARES-P** – Nagra Audio presented the hand-held digital recorder Nagra Ares-P. It is dedicated to radio applications and is the ideal companion to the Nagra Area-C, successfully introduced in 1995.

- 2001
  - Acquisition of Livewire (digital decoder software)
  - Acquisition of TicketCorner (ticketing)
  - Acquisition of Lysis (Digital TV software solutions)
  - Acquisition of SkiData (destination management software)

2001 **Nagra PL-L** – It was officially launched at the CES Show in Las Vegas. This vacuum tube line preamplifier, based on the design concept of the world-renowned Nagra PL-P, delivers perfect sound quality while conveying the emotion of music.

**Nagra-V** – The latest 2-channel wave based, removable 2.2 GB hard-disk digital portable recorder is designed for film, television and video location recording applications. It employs linear 24-bit recording technology at 44.1 kHz, 48 kHz or 96 kHz sampling rates to deliver over 2 hours of stereo recording per disk.

# KUDELSKI GROUP OVERVIEW

Headquartered in Cheseaux-sur-Lausanne in Switzerland, the Kudelski Group operates internationally. It includes several companies operating in the following sectors: conditional access and management solutions for digital TV and broadband Internet (Nagravision, MediaCrypt, Lysis, Livewire), physical access and e-ticketing solutions (SkiData, SportAccess, TicketCorner, NagraCard), health cards (e-prica), e-voting and cyber-administration (Polirights). Additionally the Nagra Audio sector develops and markets a range of products in the professional and prestige hi-fi sectors.

## HIGHLIGHTS

- Internationally-focused Swiss-based Group listed on the Swiss Market Index, which includes the top 28 blue chips in Switzerland
- Listed amongst the world's 1000 most valuable companies (Business Week, July 9<sup>th</sup>, 2001 edition)
- Included in the MSCI Index (Morgan Stanley Capital International Index)
- Over 1000 employees worldwide
- Headquarters in Cheseaux, Switzerland
- Offices in France, Germany, Spain, Italy, UK, United States, Brazil, Singapore, China, and India.

## MAIN PRODUCT LINES

- Digital TV + IP secure access systems (Nagravision, Livewire)
- Analog pay-TV systems (Nagra+)
- Rights & content management/Traffic & Scheduling (Lysis)
- Fundamental encryption technology (MediaCrypt)
- Multi-mode ticketing platform (TicketCorner)
- High security card-based systems (NagraCard)
- Physical access systems (SkiData, SportAccess)
- Professional audio and high-end hi-fi products

