HARRIS

*next level solutions*

# Harris Communications Businesses

Microwave Communications

Broadcast Communications

RF Communications

Government Communications

# Broadcast Communications Overview

Leitch Solutions

Television Broadcast

Networking & Government Systems

Harris Software Solutions

# Harris Overview

[Harris] Corporation

12,000+ employees

5,000+ engineers and scientists

Annual sales over $3 billion

Founded in 1895

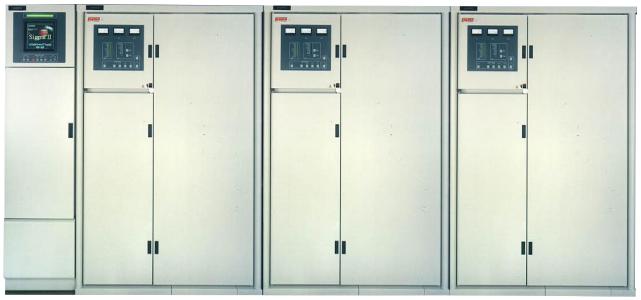
Over 70 years experience manufacturing transmitters

Expertise in all fields of video and audio systems

Global Field Service, Harris Training Center, 24/7 Product Support

# Harris TV Product Line Overview

# Television Transmitters



**Sigma Series UHF IOT DTV & Analog**

**Platinum Series VHF Solid State DTV & Analog**

**Diamond CD UHF Solid State DTV**

**Platinum HTEL Series VHF Solid State Analog**

# VHF Transmitters

- *Digital (average) power 1.25 kW to 10 kW*
- *Analog (peak) power 500W to 60 kW*
- *MOSFET Transistors*
- *Air cooled*
- *600 transmitters in service worldwide*
- *Hot pluggable modules with distributed and independent control system*

***Platinum Series***

# PlatinumCD Product Family

← PTCD10P1 - 2.5kW →

← PTCD20P2 - 5kW →

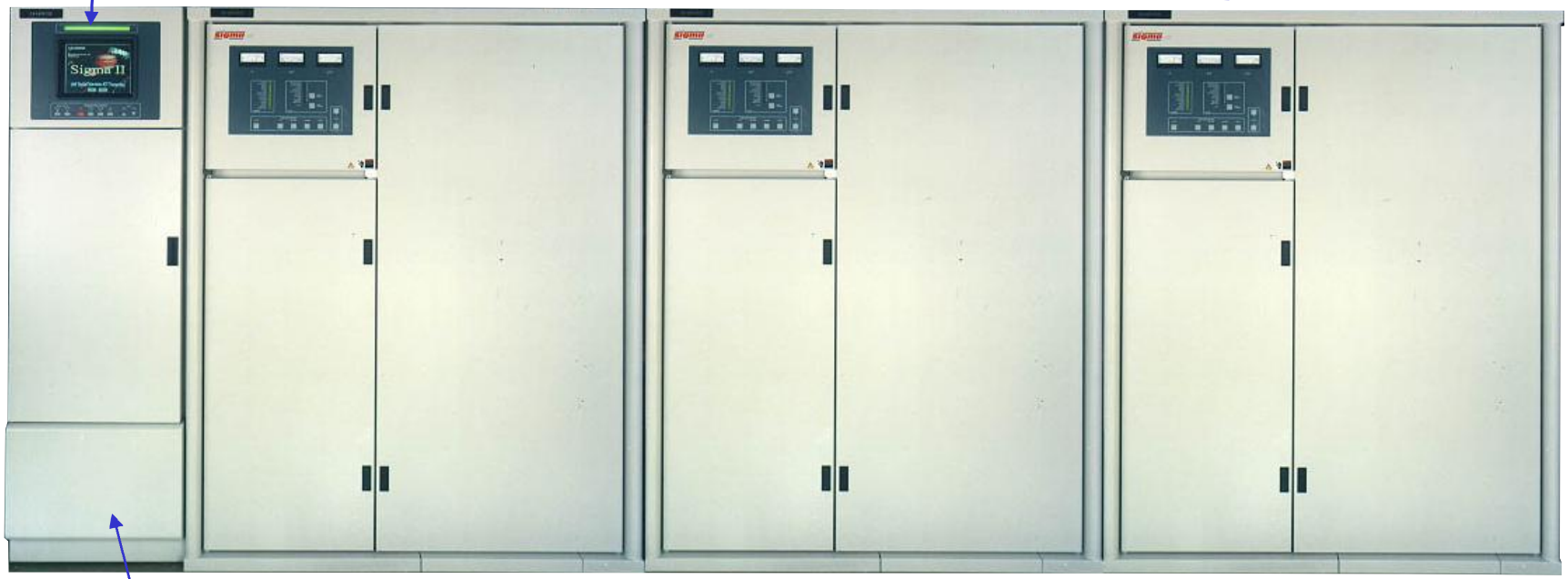
← PTCD30P3 - 7.5kW →

← PTCD40P4 - 10kW →

# Sigma CD2300P3

GUI, Main Controller & Life Support Controller

3 Identical PA Cabinets with individual controllers, IPA's, Power supplies




Exciter/Control Cabinet

# Top 10 reasons to buy Sigma CD-II

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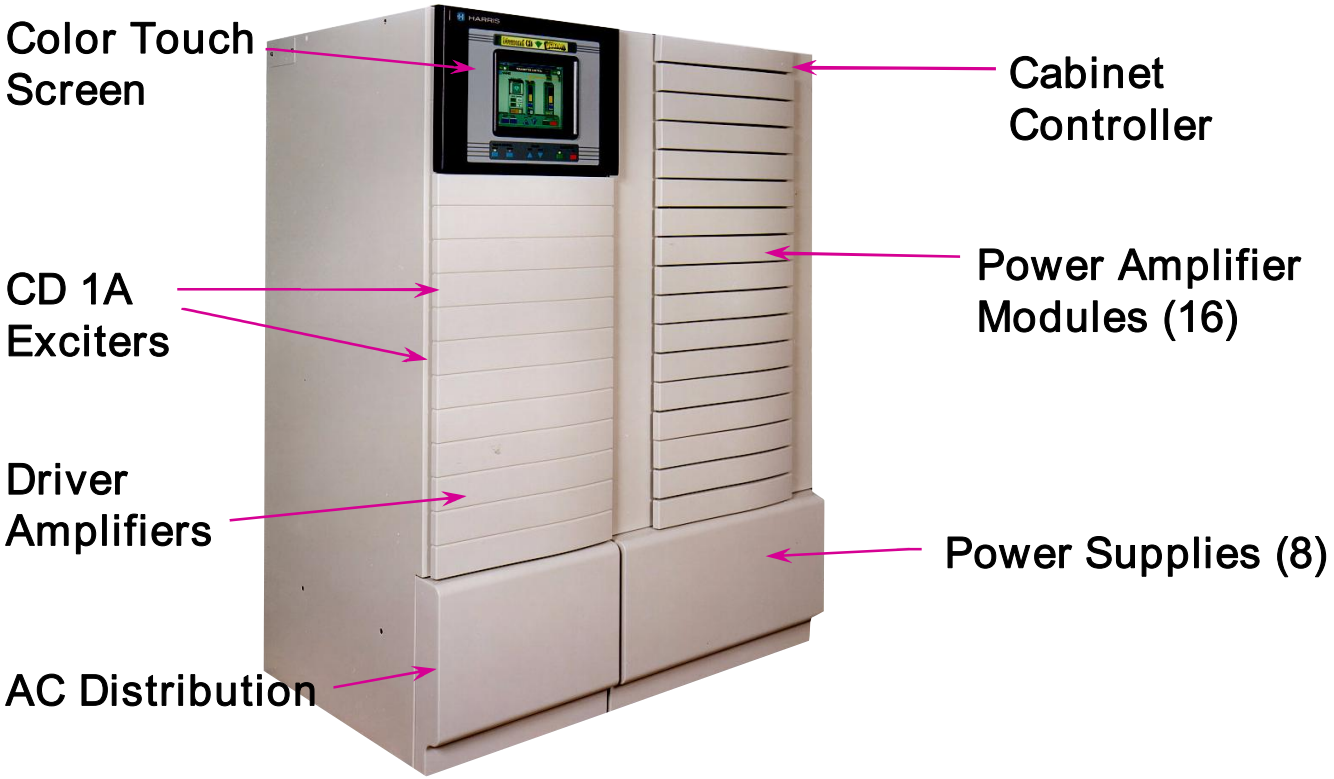
1. Individual non-linear correction for each power amplifier
2. Real Time Adaptive Correction (RTAC™ )
3. CD Eye monitor software option
4. VSWR foldback on each PA cabinet
5. Solid state class AB IPA's with feedforward
6. Automatic Gain Control (AGC) on each PA
7. Intuitive Graphical User Interface (GUI)
8. Remote control is supported via RS-232 serial or standard parallel
9. Back-up (Life Support) control system
10. Field Proven - More Sigma CD's on the air!

# UHF Transmitters

**Diamond CD**

- Digital (average) power 1.25 kW to 25 kW
- Solid state design
- LDMOS transistors
- Touch-screen GUI
- Remote control
  - Serial
  - Parallel
- Addresses low-medium power U.S. market
- Air cooled
- Hot pluggable amplifier modules and power supply modules

# DiamondCD Transmitter Layout




**Diamond CD**

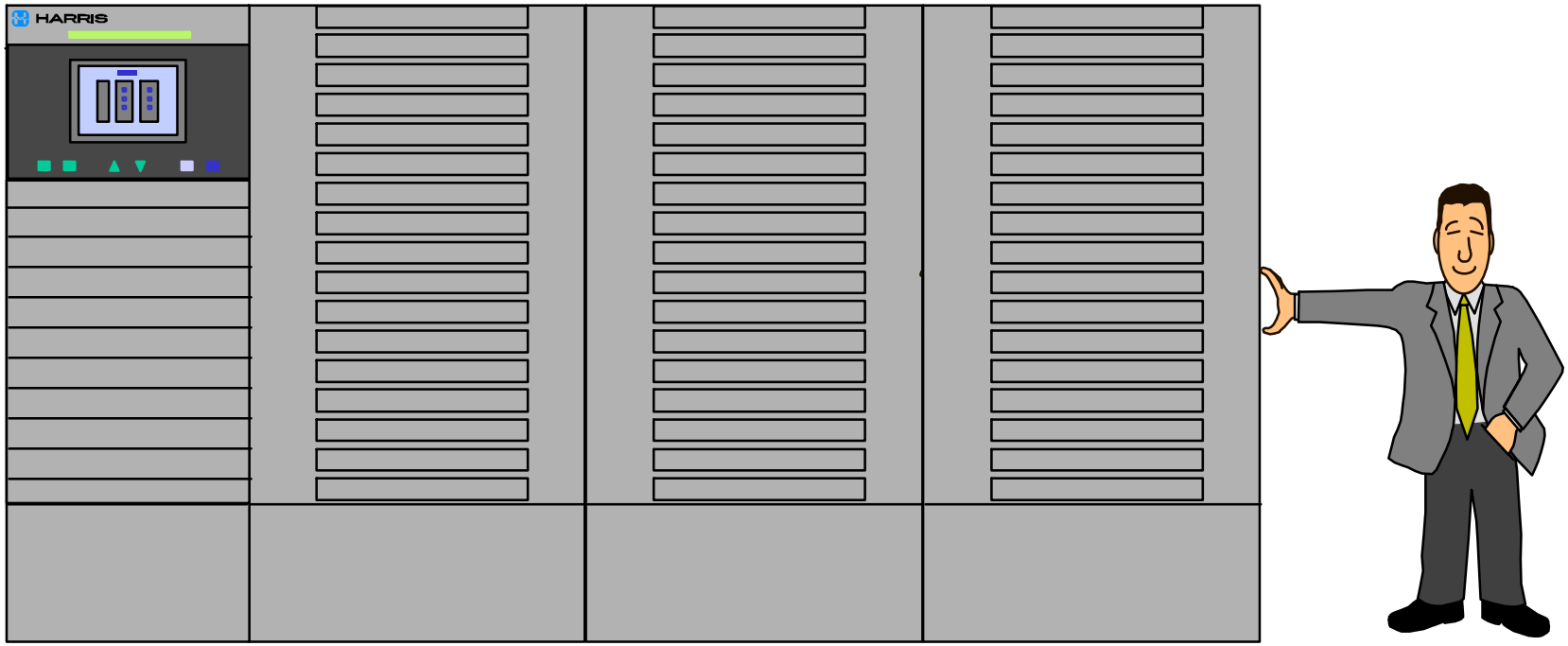
# Solid State & IOT Tx Comparison

| Characteristic | Solid State | IOT |
|---|---|---|
| Power: Average<br>Peak | 1.25 - 25kW<br>5 - 100kW | 10 - 100kW<br>40 - 400kW |
| System cost per Watt (@10kW average power) | Approx. 40% higher* | Reference |
| 10 Year Cost of Ownership | Lowest below 10 kW | Lowest above 15 kW |
| Redundancy | Very High | Need dual IOT |
| Performance | Excellent | Excellent |
| RMS Efficiency | 18 - 20% | 25 - 30% |
| Maintenance | 1/10 of tube | Reference |

** 30% Less than 2-tube system*

# Increasing Power Later...

- Add Cabinets to increase power -



# CD 1A 8-VSB Exciter

- Extensive use of DSP technology
- SMPTE 310M input interface
- Patented Design (# 5,801,595) (Digital Modulation Technique)
- RTAC - Real Time adaptive correction
- The “HEART” of Every DTV Transmitter

# DTV Antenna Solutions

- UHF & VHF designs
- Slots & Panels
- Single & Multi-channel
- High Power Designs
- Full Far Field Range
- Unique DTV/NTSC combining plans

# Harris Products in Mobile TV

- Status of Broadcast Mobile TV Market
- Comparisons of Mobile TV Technologies
- Harris Product Portfolio for Mobile TV
- Harris Services for Mobile TV
- Harris Commitment to Mobile TV

# Major Mobile TV Technical Trials

| Operator | Location | Technology | # Users | Partners |
|---|---|---|---|---|
| Crown Castle | Pittsburgh | DVB-H | | Nokia |
| KPN | Netherlands | DVB-H | 200 | Nozema, Nokia |
| Swisscom | Bern | DVB-H | 100 | |
| O2 | Oxford, UK | DVB-H | 500 | Arqiva, Nokia |
| Telstra | Sydney, Australia | DVB-H | 1000 | Bridge Networks, Broadcast Australia |
| Vodafone | Germany | DVB-H | 500 | T-Systems, Phillips |
| Digita | Helsinki, Finland | DVB-H | 500 | Nokia, TeliaSonera |
| RAI | Turin, Italy | DVB-H | | |
| Orange | Paris, France | DVB-H | 500 | Nokia, Towercast, Canal+, TDF |
| Telefonica | Madrid & Barcelona | DVB-H | 500 | Albertis Telecom, Nokia |
| MediaFLO | San Diego, CA | FLO | | Qualcomm |
| Various | Seoul, So. Korea | T-DMB | | Samsung, LG |
| BLM | Regensburg & Munich | T-DMB | | Samsung, LG |
| TF1 | Paris, France | T-DMB | | VDL |

Harris Participation

# Mobile TV Market Activity

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| | FLO | DVB-H | T-DMB |
|---|---|---|---|
| VHF/DAB | *None* | DVB committee developing mod to handle DAB channels | Korea on-air with modified DAB transmitters |
| UHF | On-air in San Diego; planning demos in Asia & Europe *12/1/05: Verizon Wireless signs to offer MediaFLO* | Approx. dozen trials in Europe & Australia | *None* |
| 1.4GHz/DAB | *None* | DVB committee developing mod to handle DAB channels | Trials in France & Germany |
| 1.67 GHz | *None* | Crown Castle on-air in Pittsburgh, installing in NYC | *None* |
| 2.6 GHz | Potential | Potential | *None* |

Commercial Activity | Potential Spectrum | No Current Activity

# Mobile TV Spectrum Alternatives

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| | Existing Services | Spectrum Availability | >5 MHz Channel Plans | Propo-gation | Antenna Gain | Cost of Imple-mentation |
|---|---|---|---|---|---|---|
| 174-240 MHz | DAB | - | - | + | - | + |
| 470-806 MHz | TV | + | + | + | 0 | + |
| 1452-1492 MHz | DAB | - | - | 0 | + | 0 |
| 1600-1700 MHz | Misc | 0 | 0 | 0 | + | 0 |
| 2500-2700 MHz | MMDS | + | + | - | + | - |

+ = Advantage  0 = Neutral  - = Disadvantage

# Mobile TV Modulation Approaches

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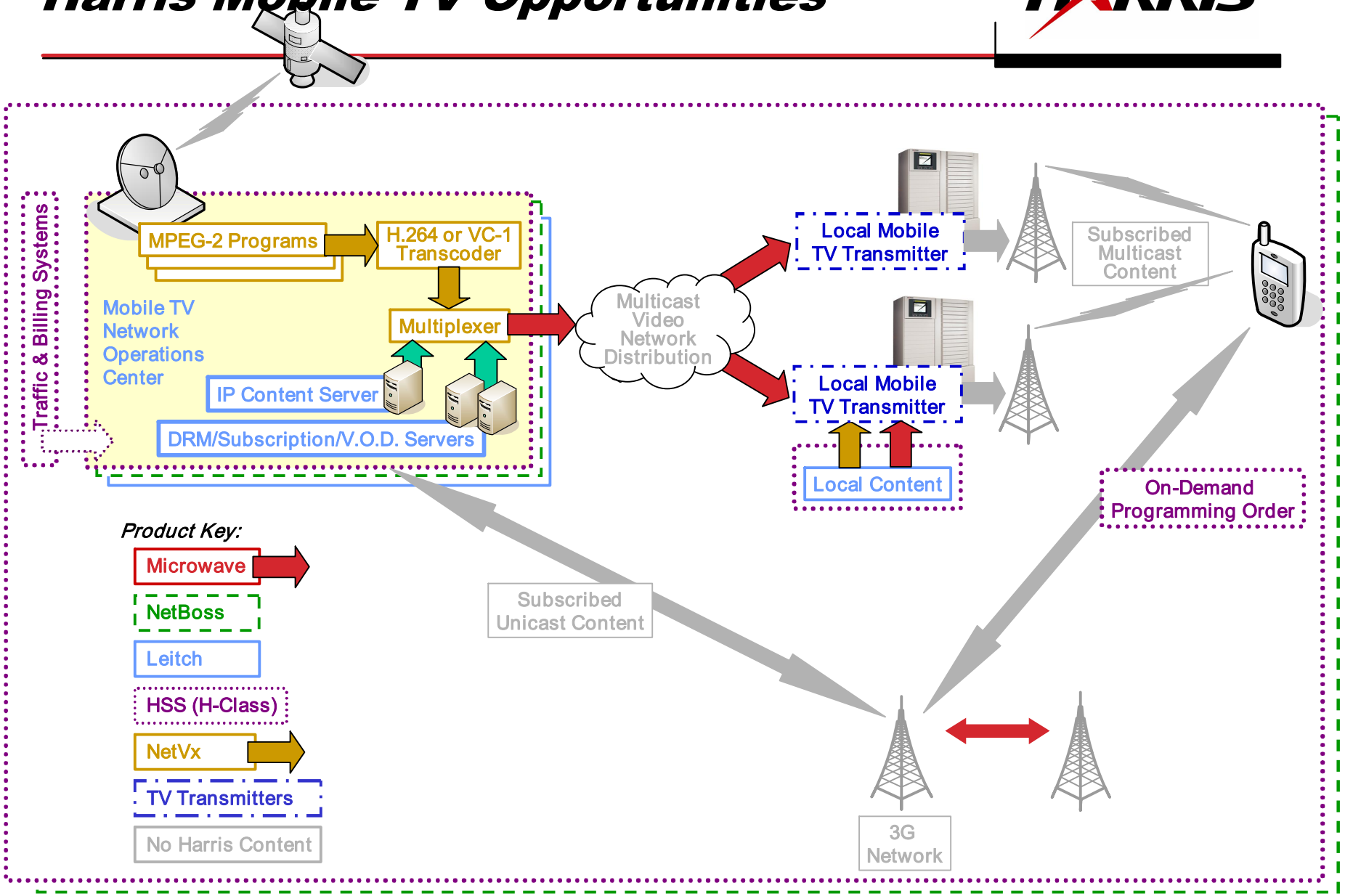
| | Source Coding | Channel Coding | Transport Stream | Modulation | RF Channel Size | Typical Video Ch per RF Channel | Local Content Injection | Power Reduction Method |
|---|---|---|---|---|---|---|---|---|
| DVB-H | H.264 or VC1 | Convolution & Reed Solomon | IP | QPSK/ 16QAM COFDM | 5/6/7/8 | 15 | Requires Mixed SFN/MFN | Time-Slicing |
| FLO | H.264 | Turbo & Reed Solomon | IP | Layered 16QAM COFDM | 5/6/7/8 | 20 | Yes, SFN | Time-Slicing |
| T-DMB | H.264 | Convolution & Reed Solomon | MPEG2 | Differential QPSK COFDM | 1.5 | 5 | Requires Mixed SFN/MFN | Bandwidth Shrinking |

# Harris Mobile TV Opportunities



# Harris Mobile TV Products

- Transmitter Products
  - DVB-T / DVB-H UHF Transmitters up to 9 kW
  - DVB-T / DVB-H VHF Transmitters up to 500 W
  - Synchrony SFN adapter for single frequency DVB-H networks
  - DVB-H 1670 MHz Transmitters up to 400 W
  - FLO capable UHF & VHF transmitters, 100 W to 60 kW
- Solution Products
  - Leitch Solutions for Studios and TV Head-ends (servers, routers, switchers, distribution amplifiers, Videotek test & measurement equipment)
  - H-CLASS Enterprise Content Management Systems
  - NetVX MPEG Compression and Multiplexing Systems
  - TruPoint Microwave Link Products
  - NetBoss Enterprise Network Management Systems

# Harris DVB-H UHF Transmitters

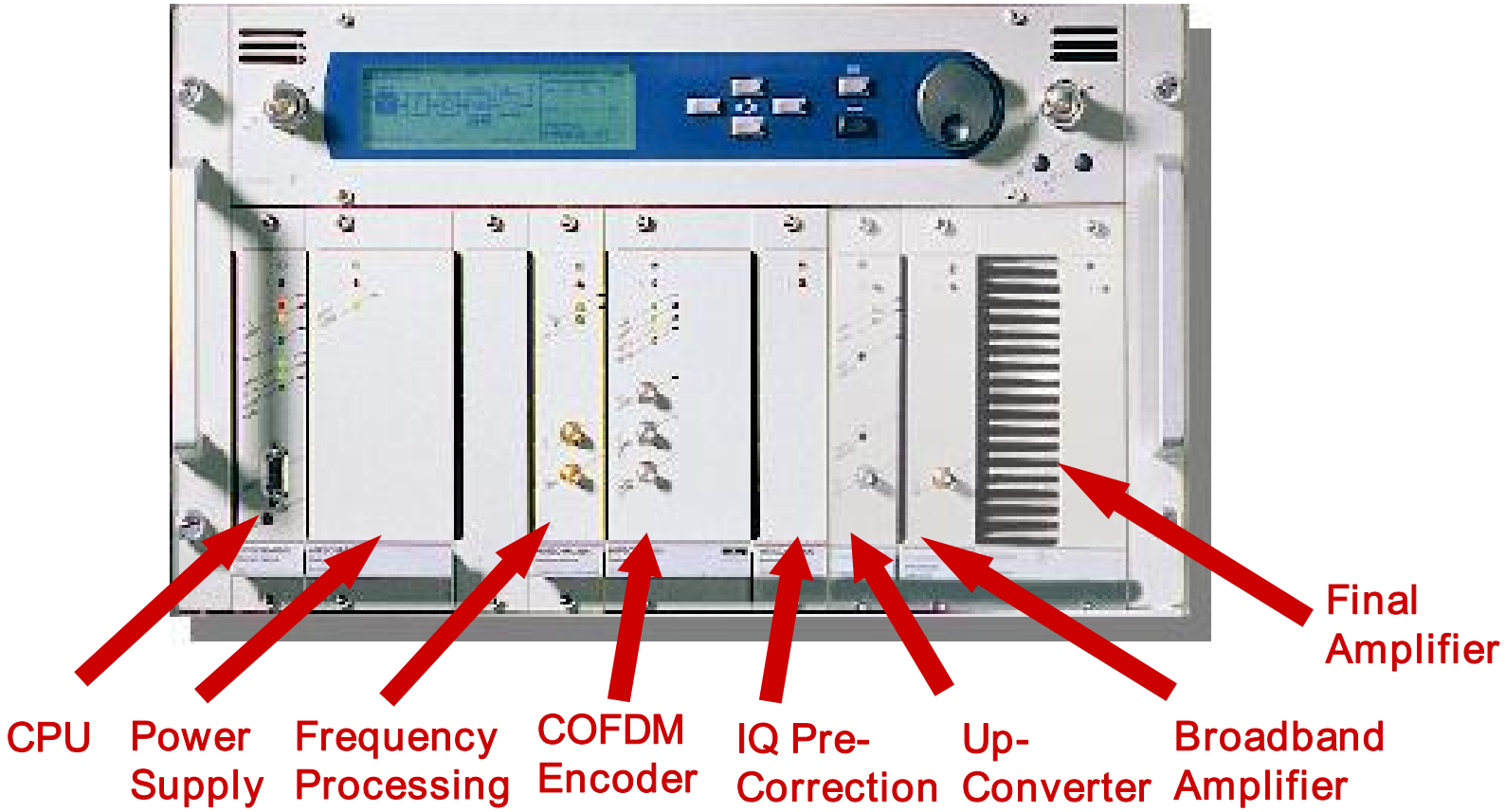
Air-Cooled

Liquid-Cooled

200 mW

9 kW

# DTV-660 Television Exciter (DVB-T and DVB-H)



# Synchrony DVB-T SFN Adapter

- DVB-T/DVB-H head-end SFN adapter for Single Frequency Broadcasting
  - Two ASI inputs for redundancy operation or hierarchical modulation
  - Meets DVB ETS 300 744 and DVB TS 101 191
  - Bit rate adaptation and PCR restamping
  - Internal PRBS generators
  - TCP/IP/SNMP interface for use in global network management systems
- Features
  - 6/7/8 MHz user selectable
  - Internal HTTP server
  - Hierarchical modes
  - Internal GPS receiver option
  - Fully DVB-H compliant

# Cool Play™ 1670

- Initially developed for Modeo
- Power levels: 50 to 400 watts, single and diversity output versions
- Designed for outdoor installations without need for a rack air-conditioning unit
- *Convection Cooled Technology*™—developed in conjunction with Harris Government Communications Systems Division
- Introducing at NAB 2006
- Shipping in July 2006
- Potential platform for other L-band applications and longer term for UHF requirements

# Harris FLO-Compatible Transmitters

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Band

UHF

Ranger

Atlas

DiamondCD

PowerCD

VHF

HTEL-CD

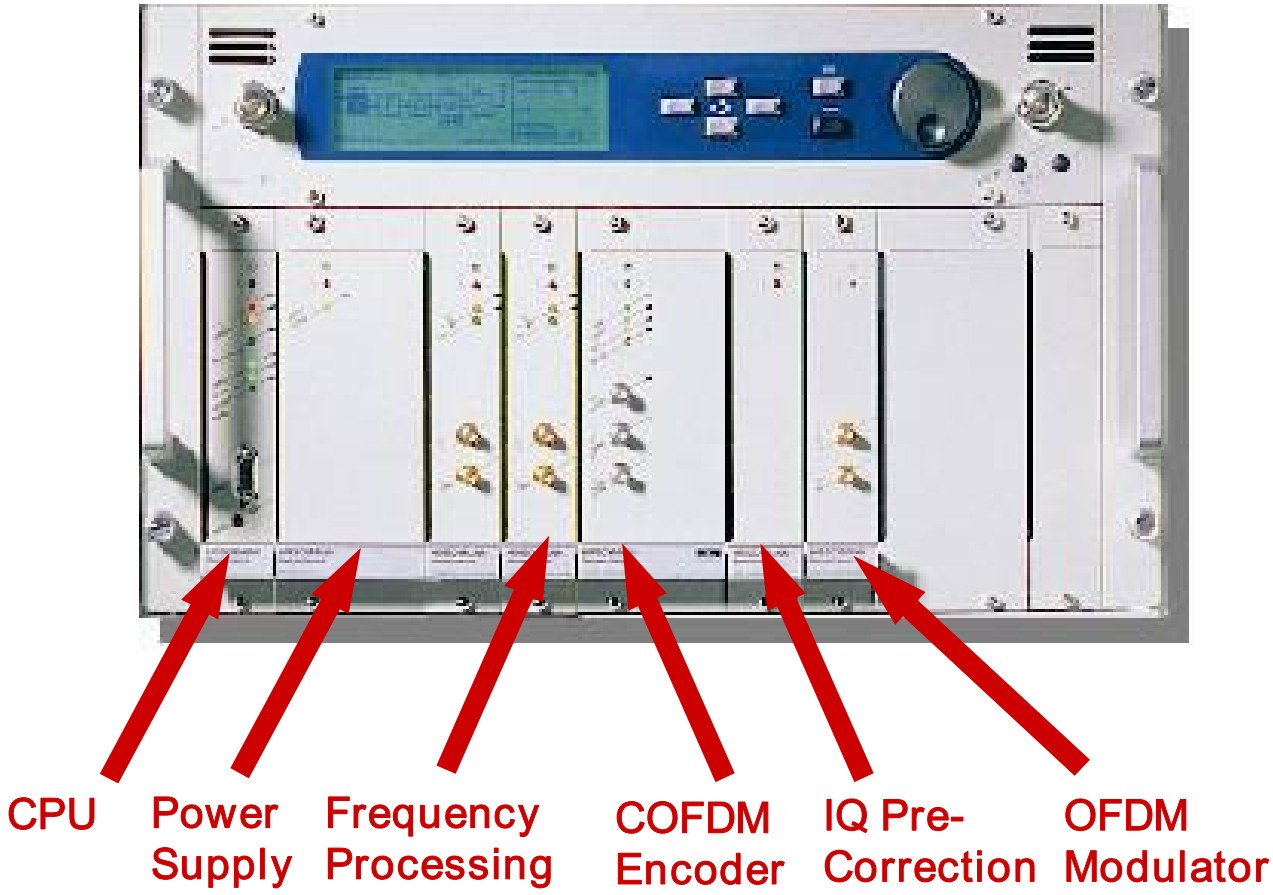
HTEL-CD

PlatinumCD

100 W — Power level — 60 kW

# Platforms for T-DMB and Video over DAB

## DAB-660 exciter platform



# Harris Mobile TV Position

- Technology base in amplification, modulation
  - Modulation: DVB-H, FLO, and DAB (T-DMB)
  - Frequencies: VHF (TV and DAB), UHF, L-Band (DAB and DVB-H)
  - Powers: 100 watts to 100,000 watts
  - Single Frequency Network enablers
- Largest digital video transmitter installed base
- Network operations and service expertise
- Leading transmitter manufacturing capacity
- Global brand strength and broadcast experience

Cool Play 1670

Atlas FLO & DVB-H

Synchrony SFN Adapter

Atlas FLO Exciter

DTV-660 DVB-H Transmitter

# Harris Infrastructure Scope

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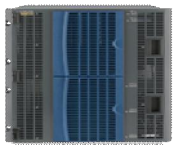
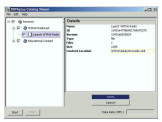
| Editing and Graphics | Store and Serve | Routing | Signal Processing | Branding | Master Control | Network Transport | Control, Monitoring and Display | Transmission |
|---|---|---|---|---|---|---|---|---|
| VelocityHD | NEXIO | Panacea | NEO | Logo | Opus HD | DataPlus | CCS | Apex |
| Inca Graphics | | Integrator Gold | 6800+ | Motion II | NEXIO MTS | Intraplex | MediaNet | Atlas |
| | | | X75 | Inscriber | DDM- 800 | NetVX | VTM- 450E SD/HD | Diamond |
| | | | | DTP | TrimStation | NetExpress | NEO SuiteView | Platinum |
| | | | | | | PISPplus | ReCon | Sigma |
| | | | | | | Content Capture | CDI | |
| | | | | | | DTP | | |





# Harris Services

- Harris Broadcast Communications: largest broadcast transmission services organization in the world
  - Installation services
  - Remote diagnostics
  - Contract services
  - Spares and repairs
- Harris Technical Services
  - Experienced IT and communications infrastructure services, including FAA modernization program
- Harris Central Control & Monitoring
  - Melbourne, FL site, monitoring Harris NetVx video encoding equipment used in FOX Sports Network

# Harris Mobile TV Commitment

- DVB-H
  - Fully integrated DVB-H transmission products
  - Harris DVB-H transmitter @ 1670 MHz on air in Crown Castle Pittsburgh test (400 W)
- FLO
  - FLO-compatible exciter based on its market-leading ATSC exciter, the Apex (over 600 Apex exciters in service)
  - All Harris ATSC transmitters, from 100 W to 60 kW, are ready to be qualified for FLO applications
- T-DMB
  - Harris DAB transmitters support major T-DMB initiatives
- Overall: Harris has identified and committed to Mobile TV as a major corporate initiative
  - Active in FLO Forum, DVB, and DAB organizations
  - Vice Chair, TIA TR47 (Mobile Multimedia Standardization)

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