

JVCKENWOOD

Kairos Product Series

Long Beach Training

Communications Division

November, 2018

What is DMR?

What is DMR?

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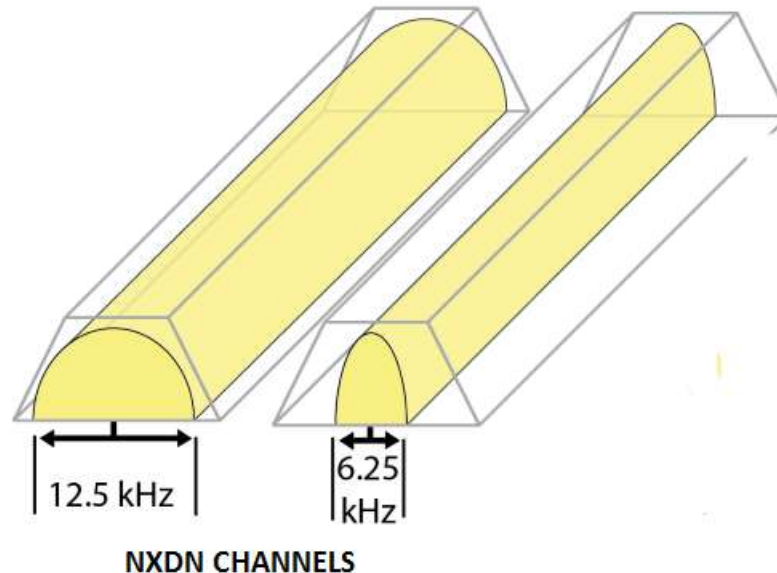
- ◆ Developed by the European Telecommunications Standards Institute (ETSI)

What is DMR?

- ◆ Developed by the European Telecommunications Standards Institute (ETSI)
- ◆ FM Transmission of digitized information

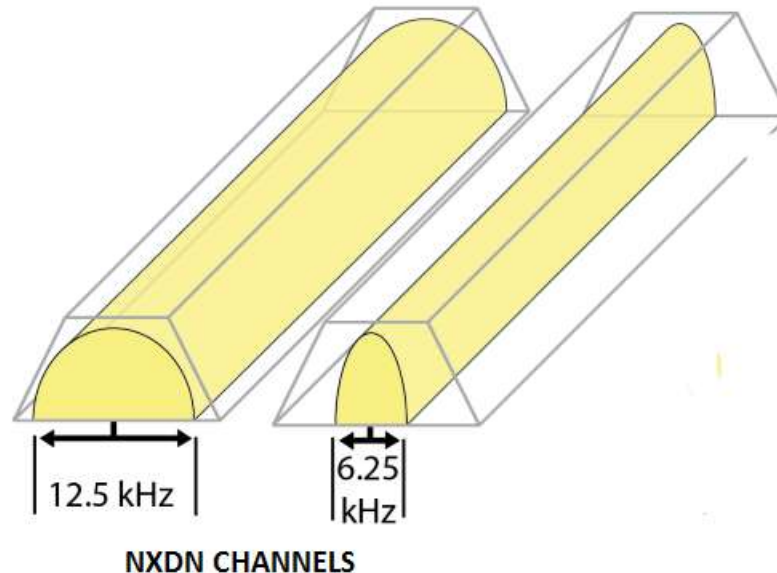
What is DMR?

- ◆ Developed by the European Telecommunications Standards Institute (ETSI)
- ◆ FM Transmission of digitized information



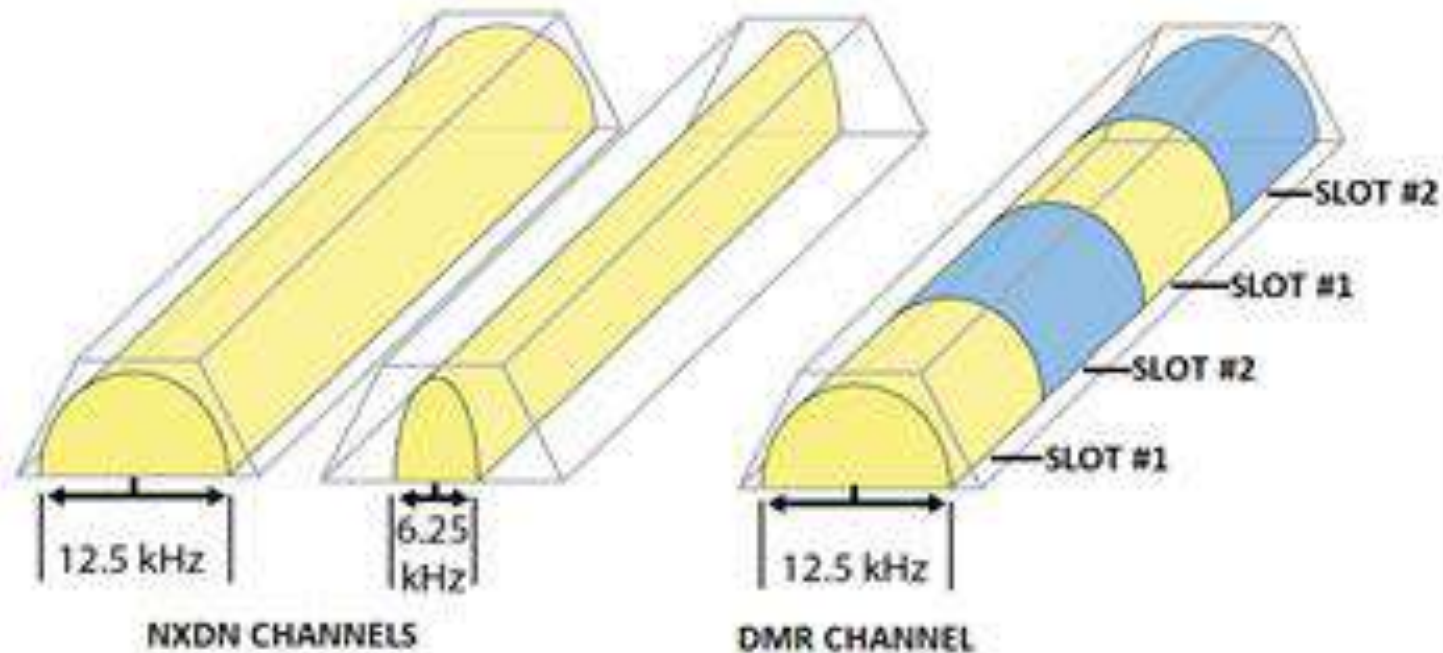
What is DMR?

- ◆ Developed by the European Telecommunications Standards Institute (ETSI)
- ◆ FM Transmission of digitized information
- ◆ TDMA



What is DMR?

- ◆ Developed by the European Telecommunications Standards Institute (ETSI)
- ◆ FM Transmission of digitized information
- ◆ TDMA



What is DMR?

◆ What is Tier I ?

◆ What is Tier II ?

◆ What is Tier III ?

What is DMR?

- ◆ Tier I

- Digital PMR446 (Digital, FDMA, Simplex)

What is DMR?

- ◆ Tier I

- Digital PMR446 (Digital, FDMA, Simplex)

Not applicable to our market

What is DMR?

- ◆ Tier II

What is DMR?

- ◆ Tier II
 - Conventional Digital TDMA

What is DMR?

- ◆ Tier II
 - Conventional Digital TDMA
 - Direct Mode
 - Repeated

What is DMR?

- ◆ Tier II
 - Conventional Digital TDMA
 - Direct Mode – True 2 Slot
 - Repeated

What is DMR?

◆ Tier II

□ Conventional Digital TDMA

- Direct Mode
- Repeated
 - *The standard covers only single site*

What is DMR?

◆ Tier II

□ Conventional Digital TDMA

- Direct Mode
- Repeated
 - *The standard covers only single site*
 - *Kenwood supports site roaming*

What is DMR?

◆ Tier II

□ Conventional Digital TDMA

- Direct Mode
- Repeated
 - *The standard covers only single site*
 - *Kenwood supports site roaming*
 - *No form of Trunking is described in Tier II*

What is DMR?

◆ Tier II

□ Conventional Digital TDMA

- Direct Mode
- Repeated
 - *The standard covers only single site*
 - *Kenwood supports site roaming*
 - *No form of Trunking is described in Tier II*
 - *Kairos supports Multisite*
 - *Simulcast is a default in Kairos' design*

What is DMR?

- ◆ Tier III

What is DMR?

- ◆ Tier III
 - Centralized Trunking (Dedicated Control Channel)

What is DMR?

- ◆ Tier III
 - Centralized Trunking (Dedicated Control Channel)
 - The “control channel” is a particular slot

What is DMR?

◆ Tier III

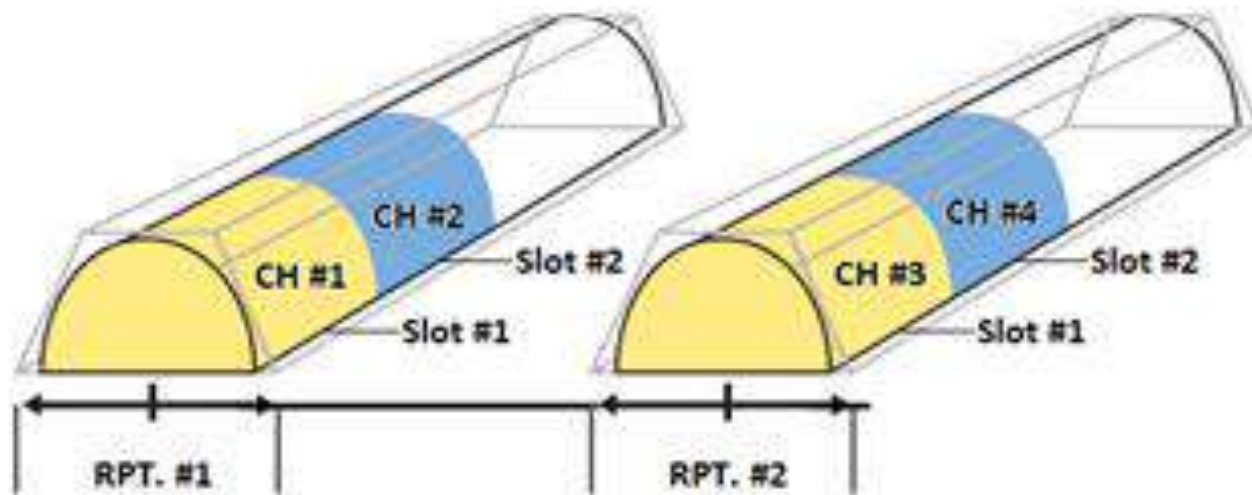
- Centralized Trunking (Dedicated Control Channel)
 - The “control channel” is a particular slot
 - All other slots are “traffic channels”

What is DMR?

◆ Tier III

□ Centralized Trunking (Dedicated Control Channel)

- The “control channel” is a particular slot
- All other slots are “traffic channels”

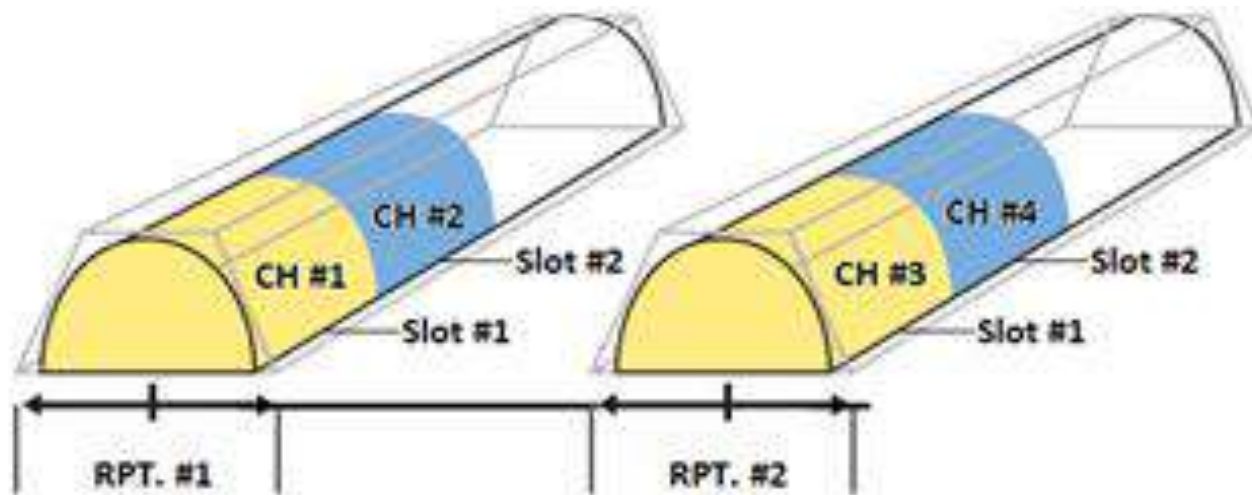


What is DMR?

◆ Tier III

□ Centralized Trunking (Dedicated Control Channel)

- The “control channel” is a particular slot
- All other slots are “traffic channels”
- FB8 required as in Nexedge Type-C



What is DMR?

- ◆ Tier III

- Kenwood does not support Tier III at this time

What is DMR?

◆ Tier III

- Kenwood does not support Tier III at this time
 - But Kairos Does !!

What is DMR?

Questions before we proceed?

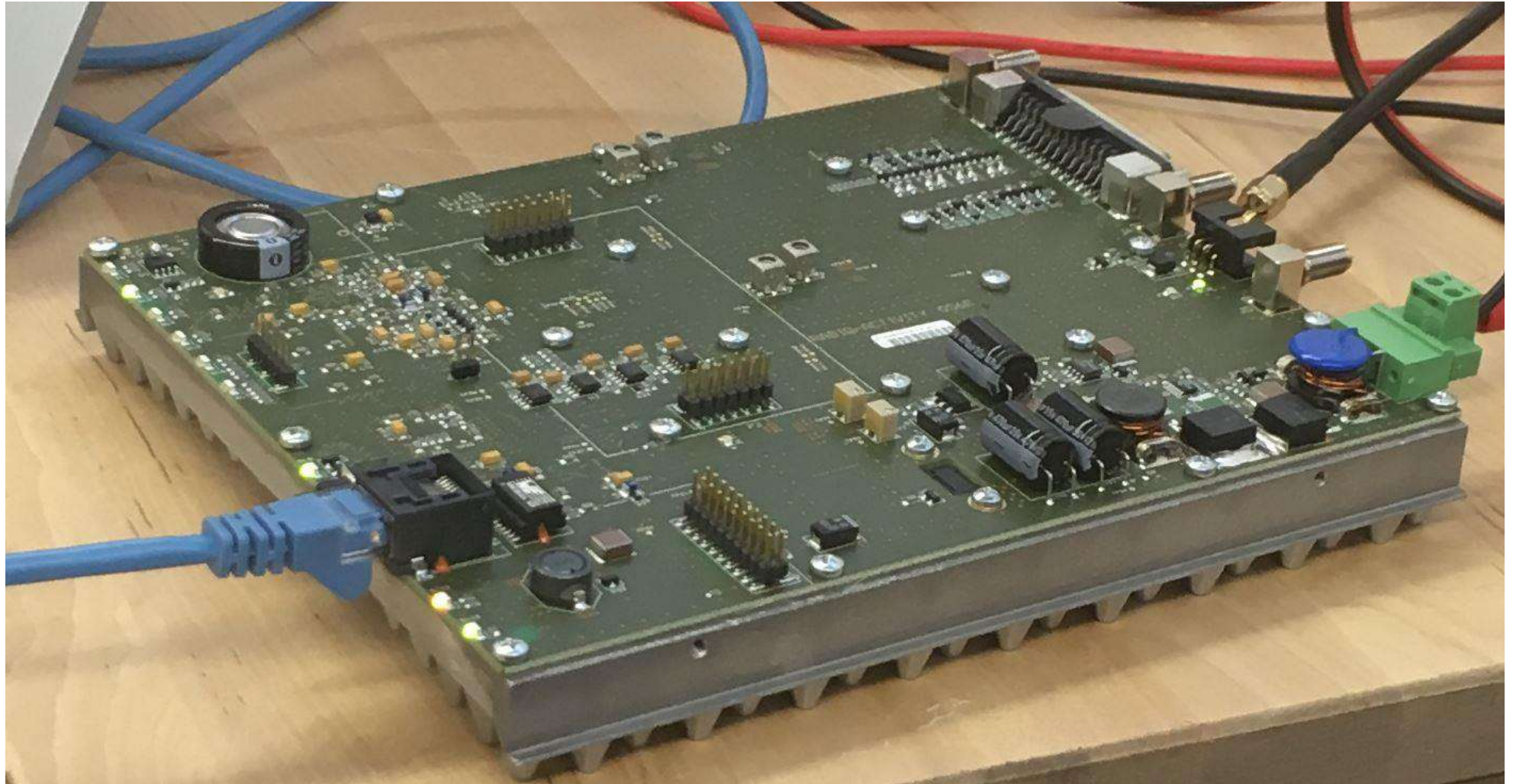
What is Kairos?

Kairos



- In classical rhetoric, **kairos** refers to the opportune time and/or place--that is, the right or appropriate time to say or do the right or appropriate thing.
- In Greek mythology, **Kairos**, the youngest child of Zeus, was the god of opportunity.

Kairos



Kairos



Kairos



Kairos



Kairos



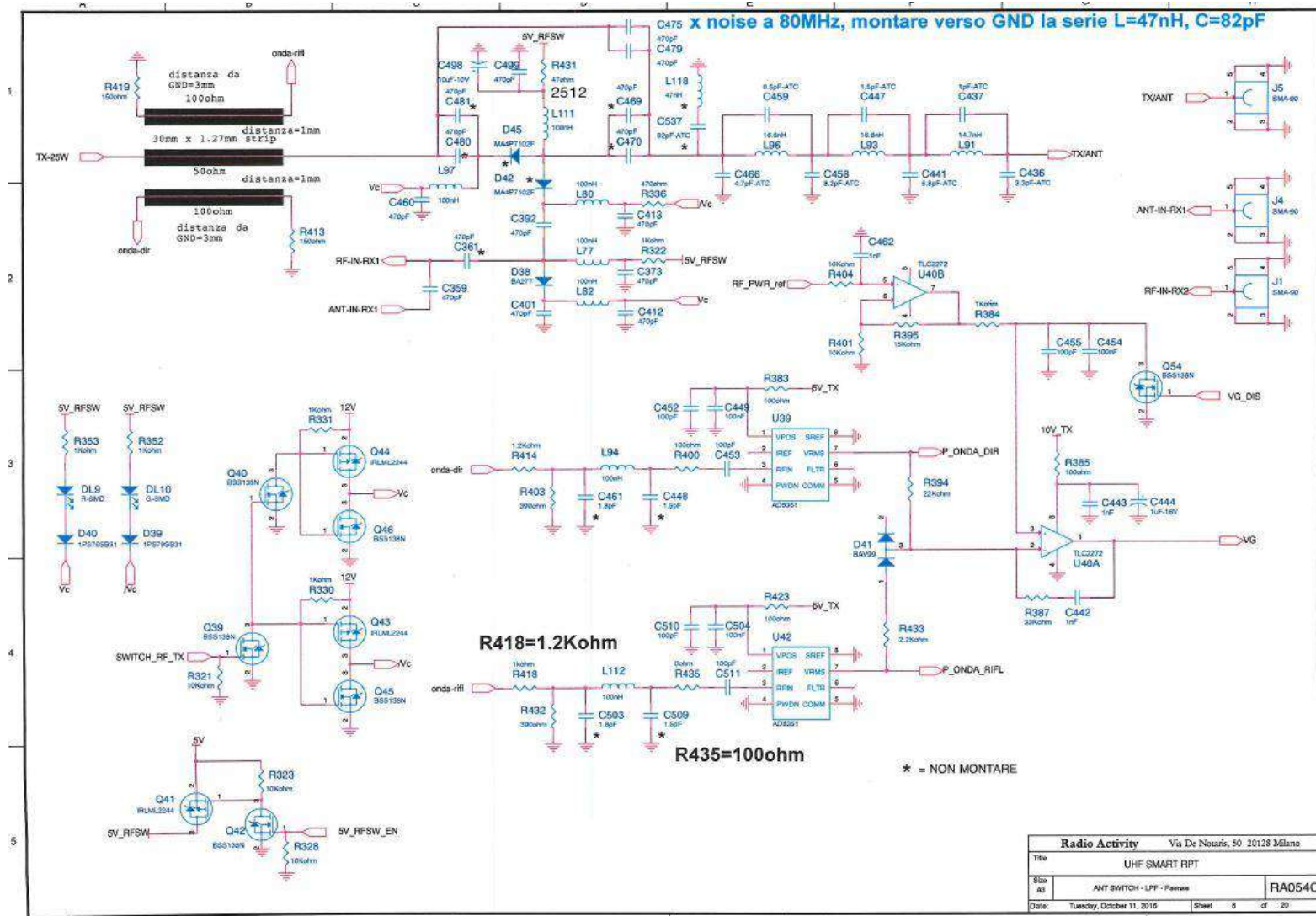
Kairos Models

Available Models	Model	KA-080	KA-160	KA-350	KA-450	KA-500	KA-900
	MHz	66-88	136-174	350-410	400-470	450-527	806-941
Channelization	25/20/12,5/6,25 KHz						
RF output power	1-25 W / 100% duty cycle / selectable per channel						
Synthesis step	50Hz						
Frequency stability	0,5 p.p.m. (without GPS or digital correction)						
Synchronization sources	Internal ref., GPS/GLONASS, Ethernet IEE-1588v2, 2 wire, Digital RX, External						
Operating temperature	-30°C ÷ +60°C						
Power supply (negative ground)	Min.	Typ.			Max.		
	11V	13,2V			15V		
Power consumption	TX: 60 W @25W RF / RX: 5 W @Main+Div enabled						
Dimensions & weight	160x200x45mm / 1.4Kg						
Audio lines	2x 4 wires + E&M						
LAN port	Ethernet 10BT/100TX (auto MDI/MDI X) on an RJ45 socket						
IP multisite bandwidth	70 kb/s in analog to/from Master						
	24 kb/s in DMR to/from Master (both DMR timeslots)						
Max tolerable IP delay	960ms (round trip)						
Alarm & control I/O	1xInput + 7xOutput						
Auxiliary I/O	4xInput + 1xOutput + 1xAnalog input						

Kairos Antenna Switch

- ◆ Kairos is shipped for full duplex operation
 - Transmit antenna port can be used for TX/RX
 - Components must be installed on the main board
 - Two capacitors must be removed from main board

Kairos Antenna Switch



Kairos Models

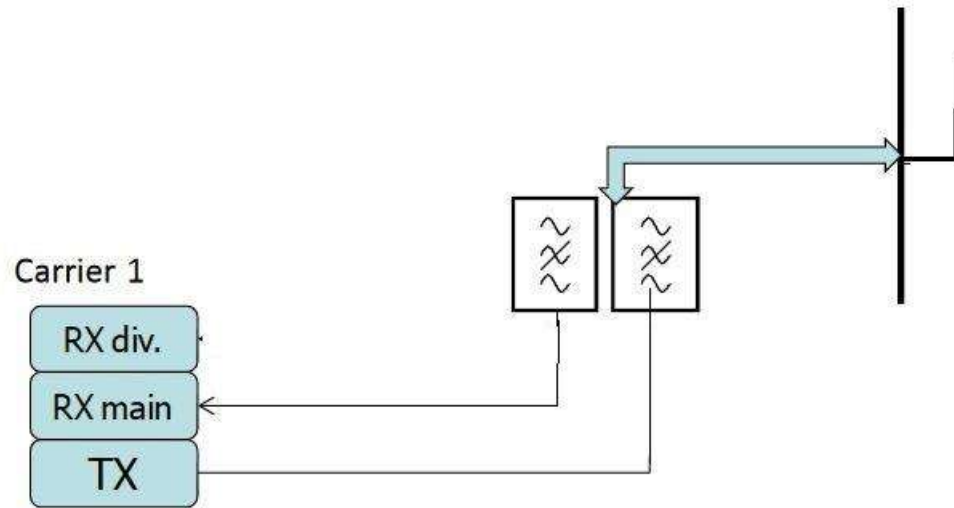
◆ Diversity Reception

- Potentially a very important advance in fixed station and repeater design
- Receive Antenna / Site Filtering design more complicated to leverage the advantage of the diversity receiver
- Use of the diversity filter in single and multiple repeater sites as opposed to alternative solutions

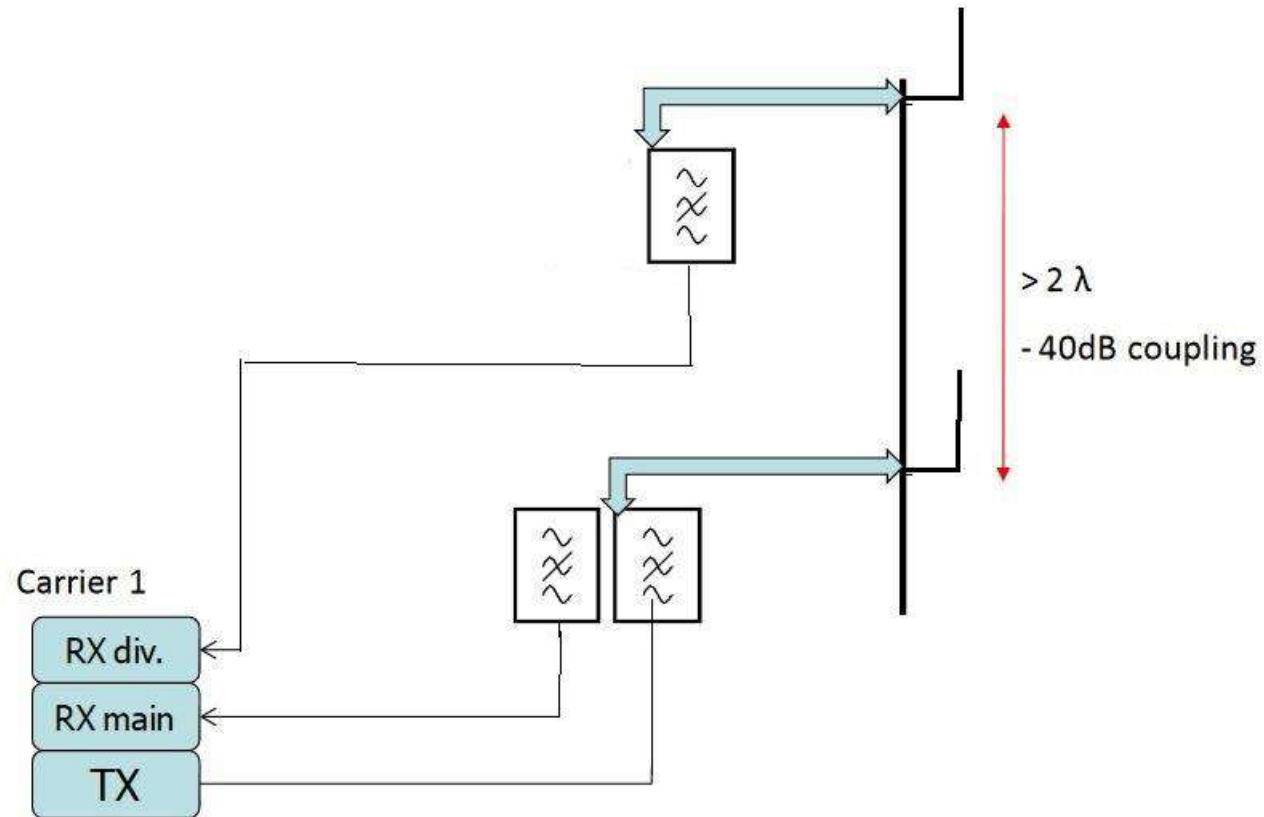
Kairos Diversity Reception



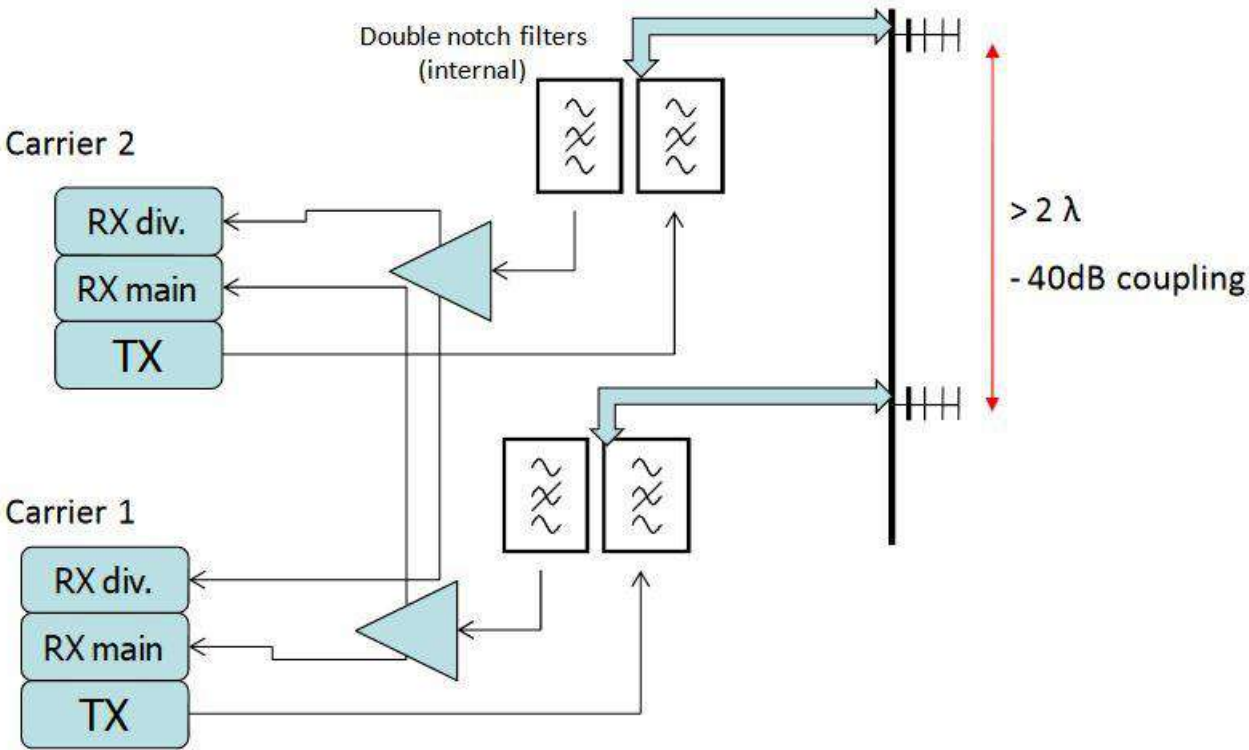
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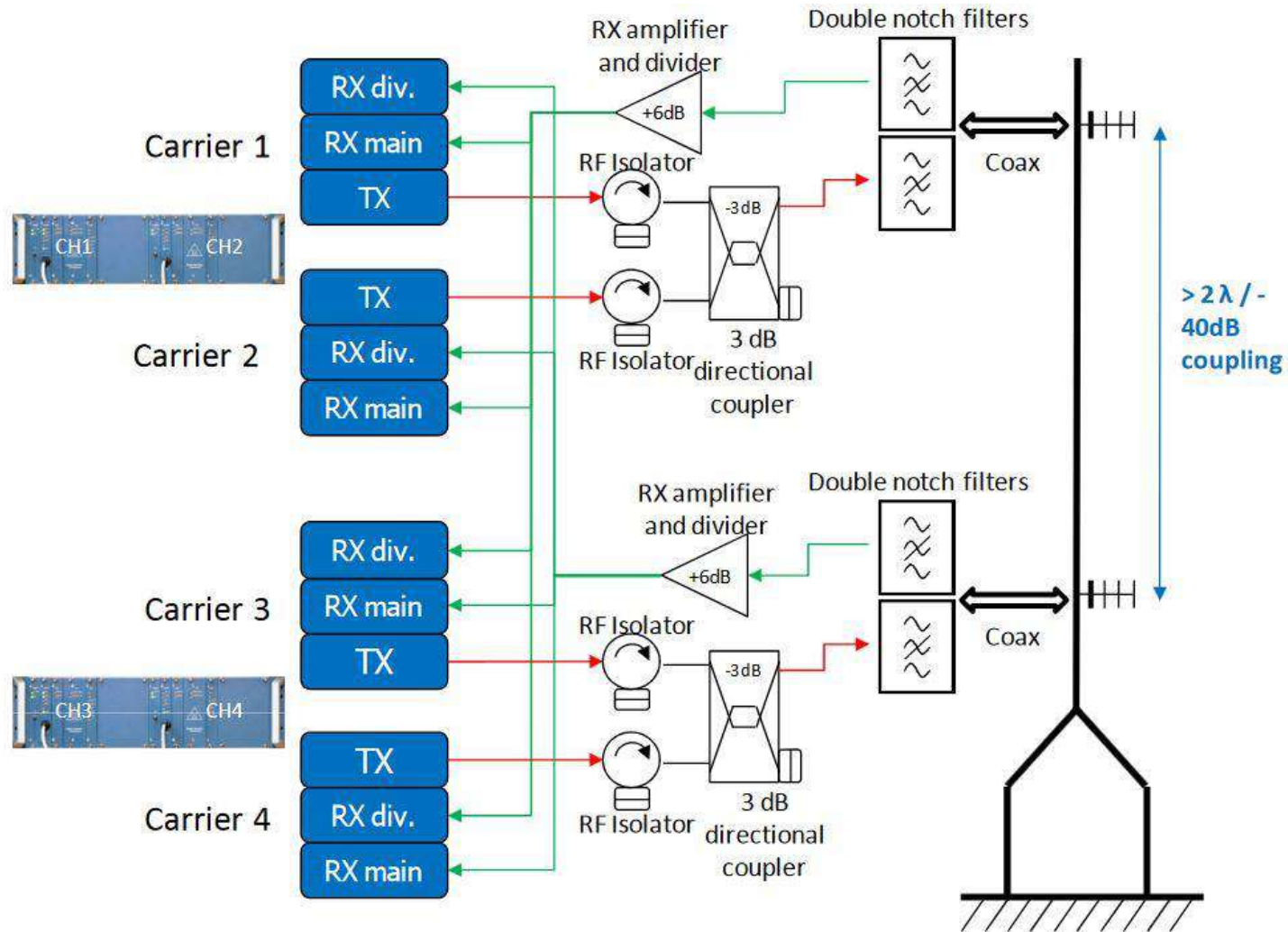
Kairos Diversity Reception



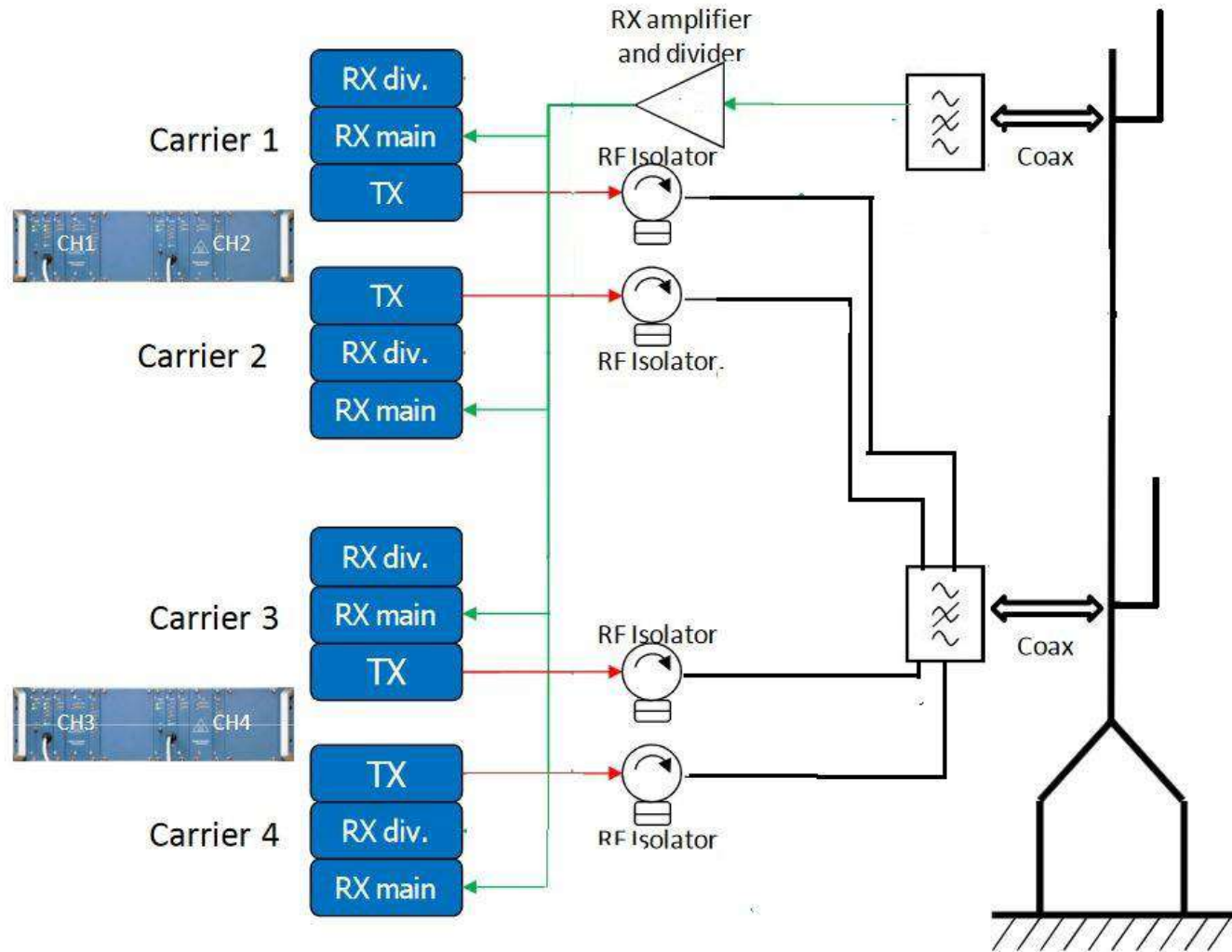
Kairos Diversity Reception



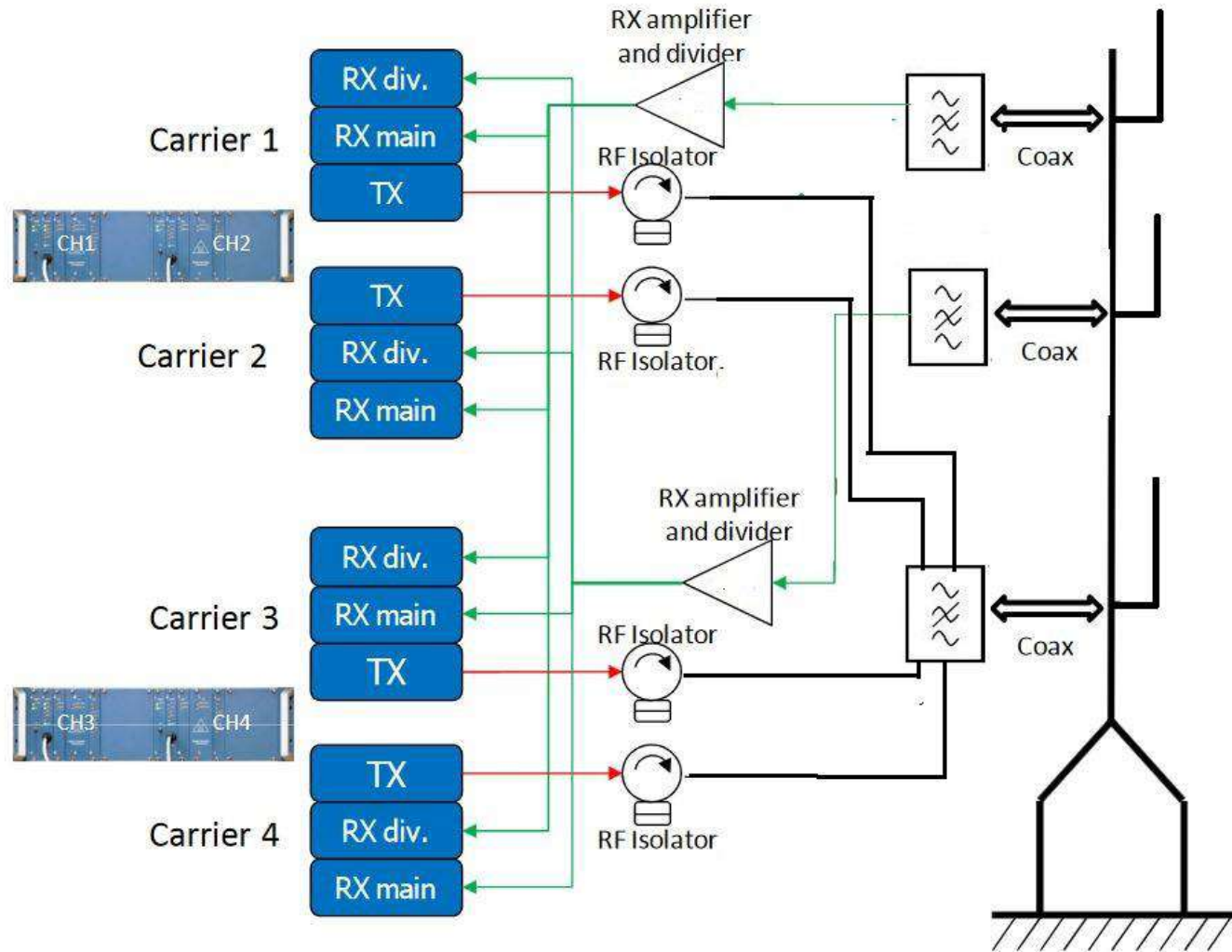
Kairos Diversity Reception



Kairos Diversity Reception



Kairos Diversity Reception



Kairos

- ◆ Accessing an unknown Kairos

Kairos

◆ Accessing an unknown Kairos

□ Default IP

- 172.33.16.140
- Power up, left two LEDs activate, press button once
- Not active unless prompted
- Not always easy to use

Kairos

◆ Accessing an unknown Kairos

□ Default IP

- 172.33.16.140
- Power up, left two LEDs activate, press button once
- Not active unless prompted
- Not always easy to use

□ Peer to Peer Mode

- 1.0.0.140
- Always active
- Easy to use

Kairos – How to generate beacons

ROAMING SETTING: BEACON



MASTER

Base Station Layer Configuration - KAIROS <KAIROS>

Configuration

Enable Repeater Mode	<input checked="" type="checkbox"/>
Direct Mode Reception	<input type="checkbox"/>
Enable Half Trunking	<input type="checkbox"/>
Send RC on Same Timeslot	<input type="checkbox"/>
Display IDLE Packets	<input checked="" type="checkbox"/>
Manual AT bit handling	<input type="checkbox"/>
Enable ETSI Tier III features	<input type="checkbox"/>

TX: act as... **RX: act as...**

... Base Station	<input checked="" type="radio"/>	... Base Station	<input checked="" type="radio"/>
... Mobile Station	<input type="radio"/>	... Mobile Station	<input type="radio"/>

MAIN Color Codes **AUX Color Codes**

RX	<input type="text" value="1"/>	RX	<input type="text" value="1"/>
TX	<input type="text" value="1"/>	TX	<input type="text" value="1"/>

Enable 4FSK Modem

Hang Times [30 ms ticks] (0 ÷ 32767)

Private Calls	<input type="text" value="150"/>
Group Calls	<input type="text" value="100"/>
Data Response	<input type="text" value="66"/>
Channel	<input type="text" value="100"/>

Timeslots Validity [30 ms ticks]

Automatic

Network Delay [30 ms ticks]

Automatic

RX Pkts Advance [30 ms ticks]

Distance for timing adv [Km]

Correzione secondo corrente

Correzione timeslot corrente

Correzione fine timing [ticks]

Base Station Operating Modes - KAIROS <KAIROS>

Base Station Parameters

Base Station Role: MASTER

Stand-Alone:

Audio Gateway:

MotoTRBO(TM) TX-interrupt handling:

Radio Network Mode: Multisite / Simulcast

Network Parameters

Voting Delay [ts]

Beacon interval [mm:ss]

DMR Packets Framing Mode: Double Packet / Single Packet

LAN Compression Rate

TX end-tone: Analog Digital

IP Parameters

Master: Present IP Address

Backup Master: Present This BS IP Address

Become Master on broken connection

Physical Console Parameters

Full-Duplex Console

Line 1 Console: All-Call Emergency Group Private

Operating Mode: ANALOG ONLY

Dest DMR ID

Line 2 Console: All-Call Emergency Group Private

Operating Mode: P25 ONLY

Dest DMR ID

ROAMING SETTING: BEACON



SLAVE

Base Station Layer Configuration - KAIROS <KAIROS>

Configuration

Enable Repeater Mode
Direct Mode Reception
Enable Half Trunking
Send RC on Same Timeslot
Display IDLE Packets
Manual AT bit handling
Enable ETSI Tier III features

TX: act as... **RX: act as...**

... Base Station ... Base Station
... Mobile Station ... Mobile Station

MAIN Color Codes **AUX Color Codes**

RX 1 TX 1
RX 1 TX 1

Enable 4FSK Modem

Hang Times [30 ms ticks] (0 ÷ 32767)

Private Calls 150
Group Calls 100
Data Response 66
Channel 100

Timeslots Validity [30 ms ticks]

Automatic 32

Network Delay [30 ms ticks]

Automatic 6

RX Pkts Advance [30 ms ticks] 0
Distance for timing adv [Km] 0
Correzione secondo corrente 0
Correzione timeslot corrente 0
Correzione fine timing [ticks] 0

Base Station Operating Modes - KAIROS <KAIROS>

Base Station Parameters

Base Station Role
BROADCASTER

Stand-Alone
Audio Gateway
MotoTRBO(TM) TX-interrupt-handling

Radio Network Mode
Multisite Simulcast

Network Parameters
Waiting Delay [s] 5
Beacon interval [mm:ss] 1:00

DMR Packets Framing Mode
Double Packet Single Packet

LAN Compression Rate 0

TX end-tone
Analog
Digital

IP Parameters

Master
Present IP Address 172.33.17.63

Backup Master
Present IP Address
This BS
Become Master on broken connection

Voice/Data reception from Master
Multicast
Broadcast
Unicast

Physical Console Parameters

Full-Duplex Console

Line 1 Console
All-Call
Emergency
Group
Private
16777215 Dest DMR ID

Line 2 Console
All-Call
Emergency
Group
Private
16777215 Dest DMR ID

Kairos – How to generate beacons

- ◆ There is NO front Panel indication that a beacon is going out
- ◆ Master and Backup Master will always beacon
- ◆ Slaves will beacon on command from a Master or Backup Master

Kairos Registration to Master

- ◆ Registration and Synchronization apply only to Kairos used in multi-repeater or multi-site applications.

Kairos Registration to Master

KAIROS Overall Status - KAIROS <Slave2>

TRX Status

DSP Ready	TRX Active
Cbr Running	Cbr OK
M. RX Fail	D. RX Fail
Interrupts from PLD	
SQ	Analog PTT
TCS/DPL	Digital PTT
RX DMR TS A	TX DMR TS A
RX DMR TS B	TX DMR TS B
RX P25	TX P25

Synchronization Status

PPS Signal from GPS	Present	Valid	Lock
PPS Signal from PTP	Present	Valid	Lock
External PPS Signal	Present	Valid	Lock
Superaudio Tone	Present	Valid	Lock
Synchronization from RF Signal or 4FSK		Lock	
Synchronization from Internal Reference		Lock	

DSP Correctly Synchronized

DSP Measures

Clear Packets Counters

Last DSP Startup:
2018-10-26 17:04:41

DMR Packets Out of Window	1
ANA Packets Out of Window	0
Safety Margin for DMR Packets	2
Safety Margin for ANA Packets	0
Timing Error [µs]	3.790
PPS Position [µs]	49.886

Features Status

- SIMULCAST Features**
- DMR Features**
- ANALOG Features**
- ETSI Tier III Features**
- NETCONTROL Access**
- SNMP Features**
- POCSAG Features**
- MULTITONE TCS Features**
- P25 Features**
- TX Features**
- SIP Features**
- Amateur Radio Features
- External Raw Access
- Audio from Web

AF Lines Status

AF to DMR Codecs	TS A	TS B	
DMR Codecs to AF	TS A	TS B	
Output Signalling	Line 1	Line 2	IP Line
Input Signalling	Line 1	Line 2	IP Line

Emergency Self-Repeating Mode
Registered to Master
Promoted to Master for Emergency

RX Measures

Peak Deviation [Hz]	4215
Estimated SINADp [dB]	1.9
Offset of received carrier [Hz]	-24

Analog Measures

Input Supply Voltage [V]	13.2
TX Temperature [°C]	24
TX Input Current [A]	N/A
Forward Power [W]	N/A
Reflected Power [W]	N/A
SWR	N/A

Commands

Set

- Unlock SQ
- Unlock TCS/DPL
- Start Transmission
- Disable TX
- Line 2 Output Signal
- Local TRX Test
- Disable Digital Squelch

Vocoders Status

Vocoder 1	Vocoder 2
-----------	-----------

Clocks Status

TX PLL Lock	RX PLL Lock
DSP <=> PLD Communication	

DMR Status

Internal Second/Timeslot	2	90
TS A TS B		
Last Received Timeslot	90	0
Frequency offset rx [Hz]	73	0
Time offset rx [ms]	0.042	0.000
Error Vector	166	0
Last Received Color Codes	1	0
Last Transmitted Data Types	9	9
RSSI Main [dBm]	-116.0	-116.2
RSSI Diversity [dBm]	-130.0	-130.0

1+1 Status

Force to SPARE

1+1 Node	Link between Nodes
----------	--------------------

Last role change: --

Close

UHF 450÷520 MHz ITU Region 2 Band

MULTIPROTOCOL DMR TIER II NODE

SLAVE BASE STATION

S/N: 500KA5613

Base Station Role: BROADCASTER

Equipment ID: 0x08409090

10.115.1.3

Kairos Synchronization

KAIROS Overall Status - KAIROS <Slave2>

TRX Status

DSP Ready	TRX Active
Cbr Running	Cbr OK
M. RX Fail	D. RX Fail
Interrupts from PLD	
SQ	Analog PTT
TCS/DPL	Digital PTT
RX DMR TS A	TX DMR TS A
RX DMR TS B	TX DMR TS B
RX P25	TX P25

Synchronization Status

PPS Signal from GPS	Present	Valid	Lock
PPS Signal from PTP	Present	Valid	Lock
External PPS Signal	Present	Valid	Lock
Superaudio Tone	Present	Valid	Lock
Synchronization from RF Signal or 4FSK			
			Lock
Synchronization from Internal Reference			Lock
DSP Correctly Synchronized			

DSP Measures

Clear Packets Counters

Last DSP Startup:
2018-10-26 17:04:41

DMR Packets Out of Window	1
ANA Packets Out of Window	0
Safety Margin for DMR Packets	2
Safety Margin for ANA Packets	0
Timing Error [µs]	3.790
PPS Position [µs]	49.886

Features Status

- SIMULCAST Features**
- DMR Features
- ANALOG Features
- ETSI Tier III Features
- NETCONTROL Access
- SNMP Features
- POCSAG Features
- MULTITONE TCS Features
- P25 Features
- TX Features
- SIP Features
- Amateur Radio Features
- External Raw Access
- Audio from Web

AF Lines Status

AF to DMR Codecs	TS A	TS B	
DMR Codecs to AF	TS A	TS B	
Output Signalling	Line 1	Line 2	IP Line
Input Signalling	Line 1	Line 2	IP Line

Emergency Self-Repeating Mode

Registered to Master

Promoted to Master for Emergency

RX Measures

Peak Deviation [Hz]	4215
Estimated SINADp [dB]	1.9
Offset of received carrier [Hz]	-24

Analog Measures

Input Supply Voltage [V]	13.2
TX Temperature [°C]	24
TX Input Current [A]	N/A
Forward Power [W]	N/A
Reflected Power [W]	N/A
SWR	N/A

Commands

Set

- Unlock SQ
- Unlock TCS/DPL
- Start Transmission
- Disable TX
- Line 2 Output Signal
- Local TRX Test
- Disable Digital Squelch

Vocoders Status

Vocoder 1	Vocoder 2
-----------	-----------

Clocks Status

TX PLL Lock	RX PLL Lock
DSP <=> PLD Communication	

DMR Status

Internal Second/Timeslot	2	90
TS A TS B		
Last Received Timeslot	90	0
Frequency offset rx [Hz]	73	0
Time offset rx [ms]	0.042	0.000
Error Vector	166	0
Last Received Color Codes	1	0
Last Transmitted Data Types	9	9
RSSI Main [dBm]	-116.0	-116.2
RSSI Diversity [dBm]	-130.0	-130.0

1+1 Status

Force to SPARE

1+1 Node	Link between Nodes
----------	--------------------

Last role change: --

Close

UHF 450÷520 MHz ITU Region 2 Band

MULTIPROTOCOL DMR TIER II NODE

SLAVE BASE STATION

S/N: 500KA5613

Base Station Role: BROADCASTER

Equipment ID: 0x08409090

10.115.1.3

Kairos Synchronization

KAIRO Overall Status - KAIROS <Slave2>

TRX Status

DSP Ready	TRX Active
Cibr Running	Cibr OK
M. RX Fail	D. RX Fail
Interrupts from PLD	
SQ	Analog PTT
TCS/DPL	Digital PTT
RX DMR TS A	TX DMR TS A
RX DMR TS B	TX DMR TS B
RX P25	TX P25

Synchronization Status

PPS Signal from GPS	Present	Valid	Lock
PPS Signal from PTP	Present	Valid	Lock
External PPS Signal	Present	Valid	Lock
Superaudio Tone	Present	Valid	Lock
Synchronization from RF Signal or 4FSK			Lock
Synchronization from Internal Reference			Lock

DSP Correctly Synchronized

DSP Measures

Clear Packets Counters

Last DSP Startup:
2018-10-26 17:04:41

DMR Packets Out of Window	1
ANA Packets Out of Window	0
Safety Margin for DMR Packets	5
Safety Margin for ANA Packets	0
Timing Error [µs]	0.000
PPS Position [µs]	-42.468

Features Status

- SIMULCAST Features**
- DMR Features**
- ANALOG Features**
- ETSI Tier III Features**
- NETCONTROL Access**
- SNMP Features**
- POCSAG Features**
- MULTITONE TCS Features**
- P25 Features**
- TX Features**
- SIP Features**
- Amateur Radio Features
- External Raw Access
- Audio from Web**

AF Lines Status

AF to DMR Codecs	TS A	TS B	
DMR Codecs to AF	TS A	TS B	
Output Signalling	Line 1	Line 2	IP Line
Input Signalling	Line 1	Line 2	IP Line

Emergency Self-Repeating Mode
Registered to Master
Promoted to Master for Emergency

RX Measures

Peak Deviation [Hz]	4311
Estimated SINADp [dB]	1.7
Offset of received carrier [Hz]	42

Analog Measures

Input Supply voltage [V]	13.3
TX Temperature [°C]	24
TX Input Current [A]	N/A
Forward Power [W]	N/A
Reflected Power [W]	N/A
S W R	N/A

Vocoders Status

Vocoder 1	Vocoder 2
-----------	-----------

Clocks Status

TX PLL Lock	RX PLL Lock
DSP <=> PLD Communication	

DMR Status

Internal Second/Timeslot	--	80
Last Received Timeslot	TS A	TS B
Frequency offset rx [Hz]	68	0
Time offset rx [ms]	57	0
Error Vector	0.042	0.000
Last Received Color Codes	89	0
Last Transmitted Data Types	1	0
RSSI Main [dBm]	9	9
RSSI Diversity [dBm]	-117.0	-117.0
	-130.0	-130.0

Commands

Set

- Unlock SQ
- Unlock TCS/DPL
- Start Transmission
- Disable TX
- Line 2 Output Signal
- Local TRX Test
- Disable Digital Squelch

1+1 Status

Force to SPARE

1+1 Node	Link between Nodes
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Last role change: --

Close

UHF 450 ÷ 520 MHz ITU Region 2 Band

MULTIPROTOCOL DMR TIER II NODE

SLAVE BASE STATION

S/N: 500KA5613

Base Station Role: BROADCASTER

Equipment ID: 0x08409090

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Kairos Synchronization

KAIRO Overall Status - KAIROS <Slave2>

TRX Status

DSP Ready	TRX Active
Cbr Running	Cbr OK
M, RX Fail	D, RX Fail
Interrupts from PLD	
SQ	Analog PTT
TCS/DPL	Digital PTT
RX DMR TS A	TX DMR TS A
RX DMR TS B	TX DMR TS B
RX P25	TX P25

Synchronization Status

PPS Signal from GPS	Present	Valid	Lock
PPS Signal from PTP	Present	Valid	Lock
External PPS Signal	Present	Valid	Lock
Superaudio Tone	Present	Valid	Lock
Synchronization from RF Signal or 4FSK			Lock
Synchronization from Internal Reference			Lock

DSP Correctly Synchronized

DSP Measures

Clear Packets Counters

Last DSP Startup:
2018-10-26 17:04:41

DMR Packets Out of Window	1
ANA Packets Out of Window	0
Safety Margin for DMR Packets	5
Safety Margin for ANA Packets	0
Timing Error [µs]	0.000
PPS Position [µs]	42.468

Features Status

- SIMULCAST Features**
- DMR Features**
- ANALOG Features**
- ETSI Tier III Features**
- NETCONTROL Access**
- SNMP Features**
- POCSAG Features**
- MULTITONE TCS Features**
- P25 Features**
- TX Features**
- SIP Features**
- Amateur Radio Features
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- Audio from Web**

AF Lines Status

AF to DMR Codecs	TS A	TS B	
DMR Codecs to AF	TS A	TS B	
Output Signalling	Line 1	Line 2	IP Line
Input Signalling	Line 1	Line 2	IP Line

Emergency Self-Repeating Mode
Registered to Master
Promoted to Master for Emergency

RX Measures

Peak Deviation [Hz]	4914
Estimated SINADp [dB]	2.1
Offset of received carrier [Hz]	44

Analog Measures

Input Supply Voltage [V]	13.3
TX Temperature [°C]	23
TX Input Current [A]	N/A
Forward Power [W]	N/A
Reflected Power [W]	N/A
S W R	N/A

Commands

Set

- Unlock SQ
- Unlock TCS/DPL
- Start Transmission
- Disable TX
- Line 2 Output Signal
- Local TRX Test
- Disable Digital Squelch

Vocoders Status

Vocoder 1	Vocoder 2
-----------	-----------

Clocks Status

TX PLL Lock	RX PLL Lock
DSP <=> PLD Communication	

DMR Status

Internal Second/Timeslot	2	71
Last Received Timeslot		
TS A	TS B	
68	0	
Frequency offset rx [Hz]		
57	0	
Time offset rx [ms]		
0.042	0.000	
Error Vector		
89	0	
Last Received Color Codes		
1	0	
Last Transmitted Data Types		
9	9	
RSSI Main [dBm]		
-116.3	-116.7	
RSSI Diversity [dBm]		
-130.0	-130.0	

1+1 Status

Force to SPARE

1+1 Node	Link between Nodes
----------	--------------------

Last role change: --

Close

UHF 450÷520 MHz ITU Region 2 Band

MULTIPROTOCOL DMR TIER II NODE

SLAVE BASE STATION

S/N: 500KA5613

Base Station Role: BROADCASTER

Equipment ID: 0x08409090

10.115.1.3

Kairos Synchronization

KAIROs Overall Status - KAIROS <Slave2>

TRX Status

DSP Ready	TRX Active
Cbr Running	Cbr OK
M. RX Fail	D. RX Fail
Interrupts from PLD	
SQ	Analog PTT
TCS/DPL	Digital PTT
RX DMR TS A	TX DMR TS A
RX DMR TS B	TX DMR TS B
RX P25	TX P25

Synchronization Status

PPS Signal from GPS	Present	Valid	Lock
PPS Signal from PTP	Present	Valid	Lock
External PPS Signal	Present	Valid	Lock
Superaudio Tone	Present	Valid	Lock
Synchronization from RF Signal or 4FSK			Lock
Synchronization from Internal Reference			Lock

DSP Correctly Synchronized

DSP Measures

Clear Packets Counters

Last DSP Startup:
2018-10-26 17:04:41

DMR Packets Out of Window	1
ANA Packets Out of Window	0
Safety Margin for DMR Packets	2
Safety Margin for ANA Packets	0
Timing Error [µs]	-2.820
PPS Position [µs]	36.966

Features Status

- SIMULCAST Features
- DMR Features
- ANALOG Features
- ETSI Tier III Features
- NETCONTROL Access
- SNMP Features
- POCSAG Features
- MULTITONE TCS Features
- TX Features
- SIP Features
- Amateur Radio Features
- External Raw Access
- Audio from Web

AF Lines Status

AF to DMR Codecs	TS A	TS B	
DMR Codecs to AF	TS A	TS B	
Output Signalling	Line 1	Line 2	IP Line
Input Signalling	Line 1	Line 2	IP Line

Emergency Self-Repeating Mode
Registered to Master
Promoted to Master for Emergency

RX Measures

Peak Deviation [Hz]	4158
Estimated SINADp [dB]	2.2
Offset of received carrier [Hz]	45

Commands

Set

- Unlock SQ
- Unlock TCS/DPL
- Start Transmission
- Disable TX
- Line 2 Output Signal
- Local TRX Test
- Disable Digital Squelch

Vocoders Status

Vocoder 1	Vocoder 2
-----------	-----------

Analog Measures

Input Supply Voltage [V]	13.3
TX Temperature [°C]	24
TX Input Current [A]	N/A
Forward Power [W]	N/A
Reflected Power [W]	N/A
SWR	N/A

Clocks Status

TX PLL Lock	RX PLL Lock
-------------	-------------

DSP <=> PLD Communication

DMR Status

Internal Second/Timeslot	4	155
Last Received Timeslot		
TS A	TS B	
90	0	
Frequency offset rx [Hz]	73	0
Time offset rx [ms]	0.042	0.000
Error Vector	166	0
Last Received Color Codes	1	0
Last Transmitted Data Types	9	9
RSSI Main [dBm]	-115.8	-115.8
RSSI Diversity [dBm]	-130.0	-130.0

1+1 Status

Force to SPARE

1+1 Node	Link between Nodes
----------	--------------------

Last role change: --

UHF 450÷520 MHz ITU Region 2 Band MULTIPROTOCOL DMR TIER II NODE SLAVE BASE STATION

S/It: 500KA5613 Base Station Role: BROADCASTER Equipment ID: 0x08409090 10.115.1.3

Kairos Synchronization

Synchronization mode

1st Choice

2nd Choice

3rd Choice

4th Choice

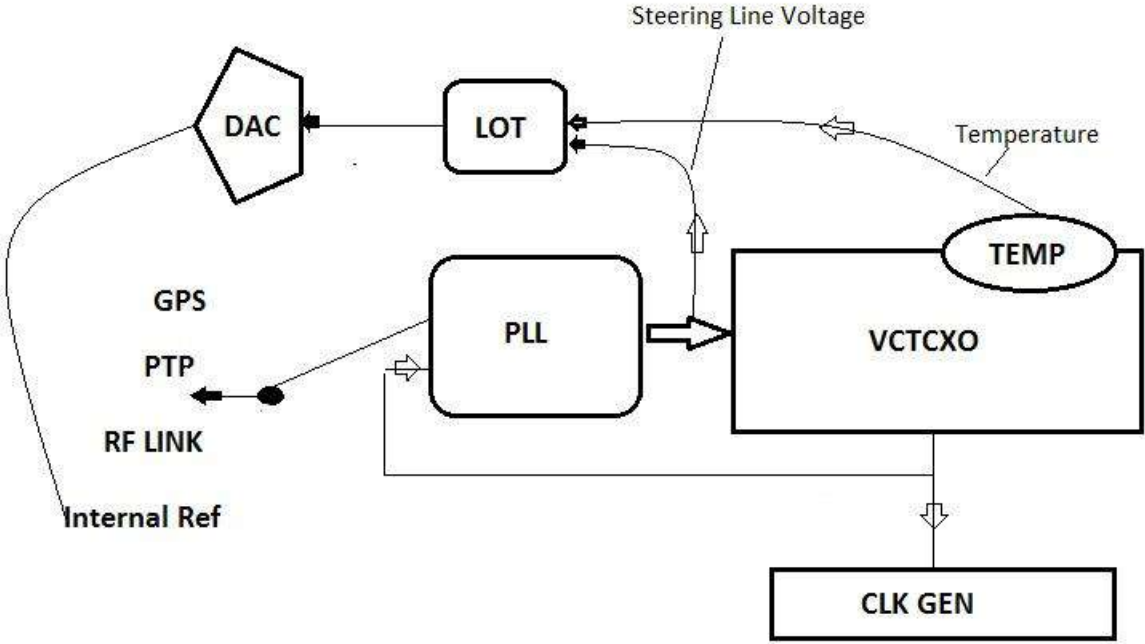
Superaudio Synchronization

Lock Frequency [Hz]

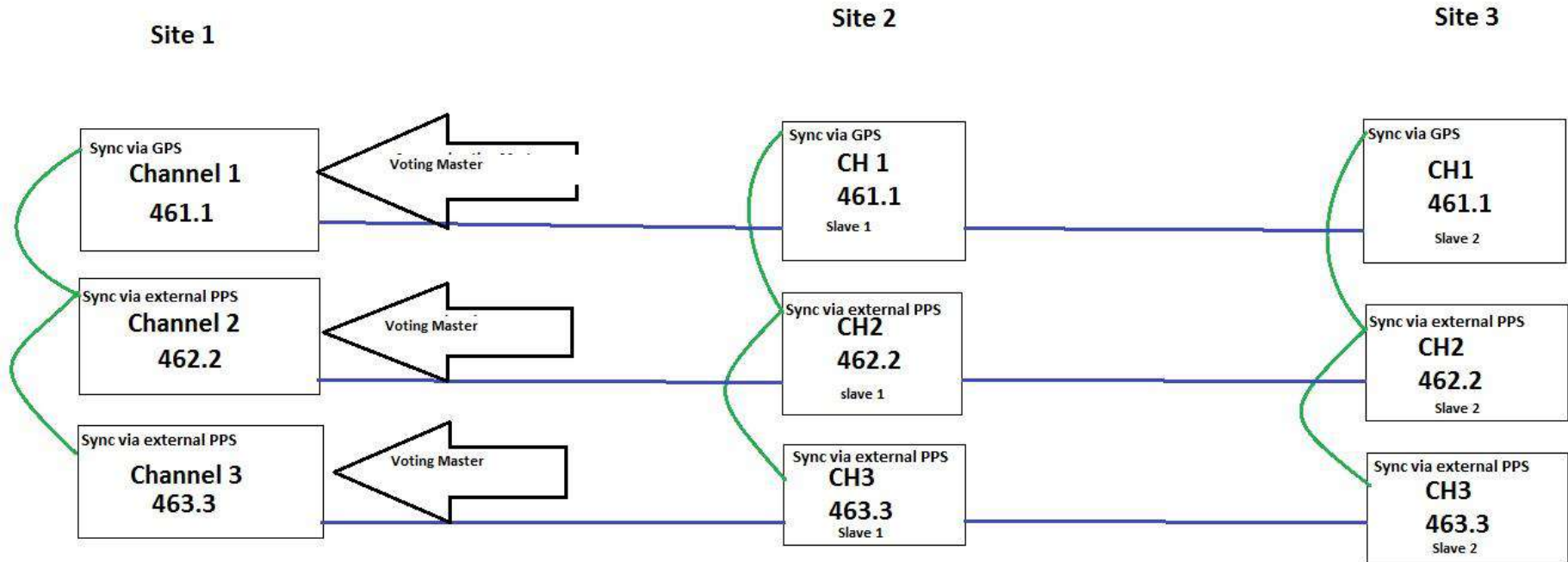
RF Synchronization

Frequency Offset [Hz]

Kairos and its internal reference

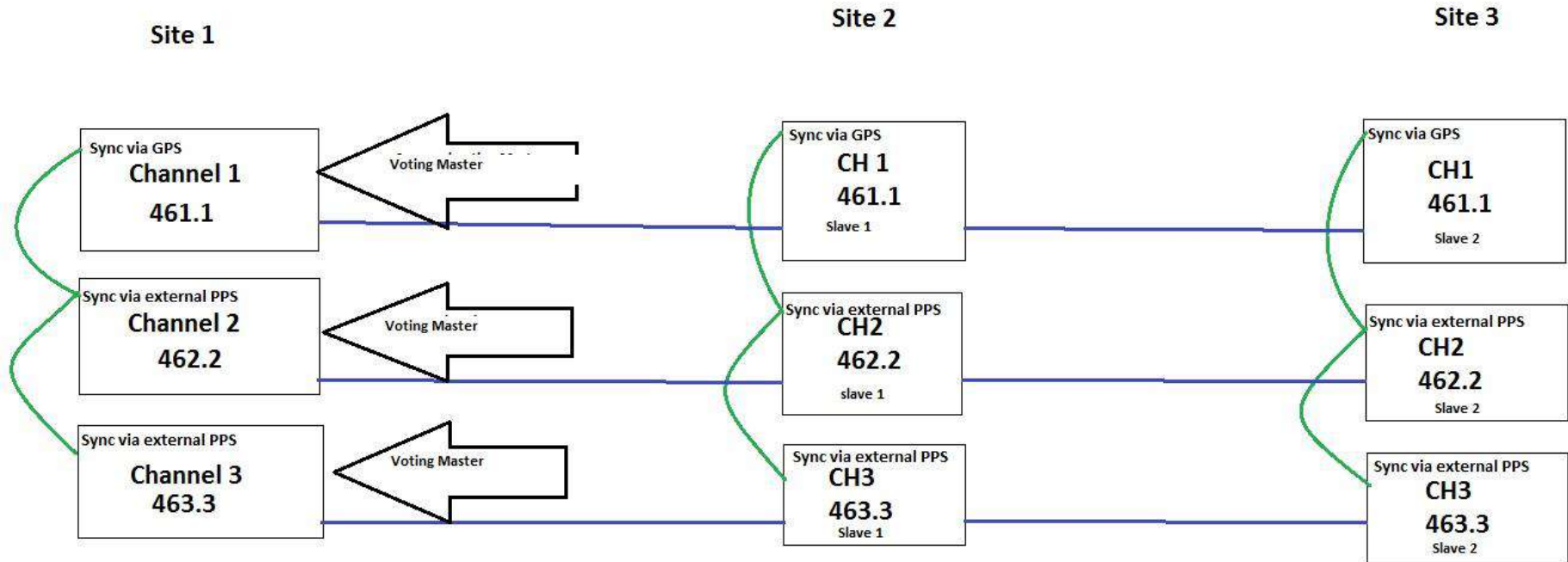


Kairos – Network Delay and Sync

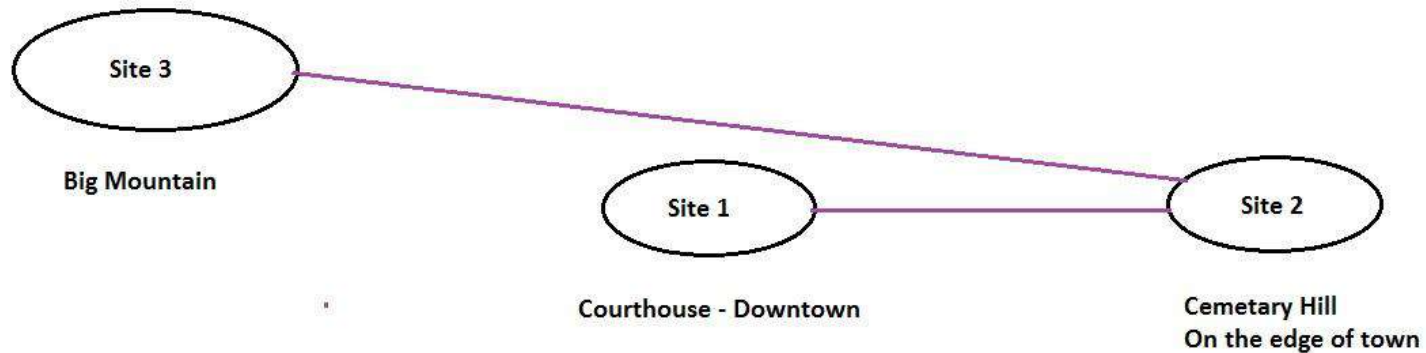


Blue lines are network connections. Green lines are PPS ribbon cables.

Kairos – Network Delay and Sync



Blue lines are network connections. Green lines are PPS ribbon cables.



Kairos – Network Delay and Sync

∞ Base Station Layer Configuration - KAIROS <LINK UP UHF SITO 1>

Configuration

Enable Repeater Mode

Direct Mode Reception

Send RC on Same Timeslot

Display IDLE Packets

Manual AT bit handling

Enable ETSI Tier III features

TX: act as... **RX: act as...**

... Base Station ... Base Station

... Mobile Station ... Mobile Station

MAIN Color Codes **AUX Color Codes**

RX RX

TX TX

Hang Times [30 ms ticks] (0 ÷ 32767)

Private Calls

Group Calls

Data Response

Channel

Timeslots Validity [30 ms ticks]

Automatic

Network Delay [30 ms ticks]

Automatic

RX Pkts Advance [30 ms ticks]

Distance for timing adv [Km]

Reports

DMR Status

Digital Mode Enabled

Internal Timings

Current Second/Timeslot

Current Extended Timeslot

	TS A	TS B
Last Received Timeslot	12	13
Frequency offset rx [Hz]	9	8
Time offset rx [ms]	0.000	0.000
Error Vector	31	51
Last Received Color Codes	1	1
Last Transmitted Data Types	0	0

TRANSMITTING TSA TSB

RECEIVING

MS-TO-MS DIRECT

Accesso

Reading

 Repeat Reading

Kairos and GPS

- ◆ Most issues are PTP-sync related
 - Use of GPS makes things easy
 - Use of sync cable in multiple repeater installations with one repeater the GPS sync source is very effective
 - There are no sync issues with a stand-alone Kairos

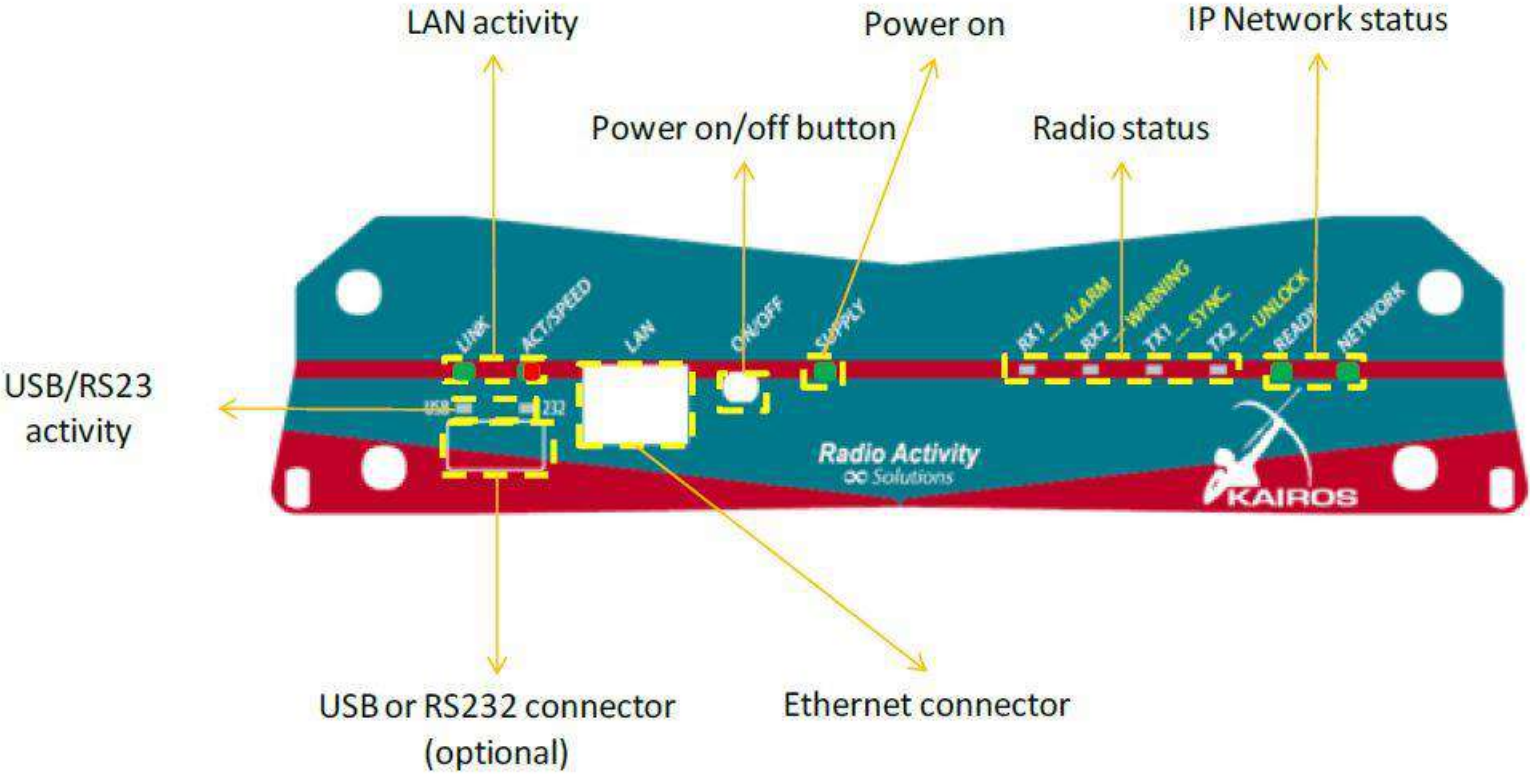
Kairos Troubleshooting

- ◆ LEDs

- The LEDs were designed to tell you a lot, and they do

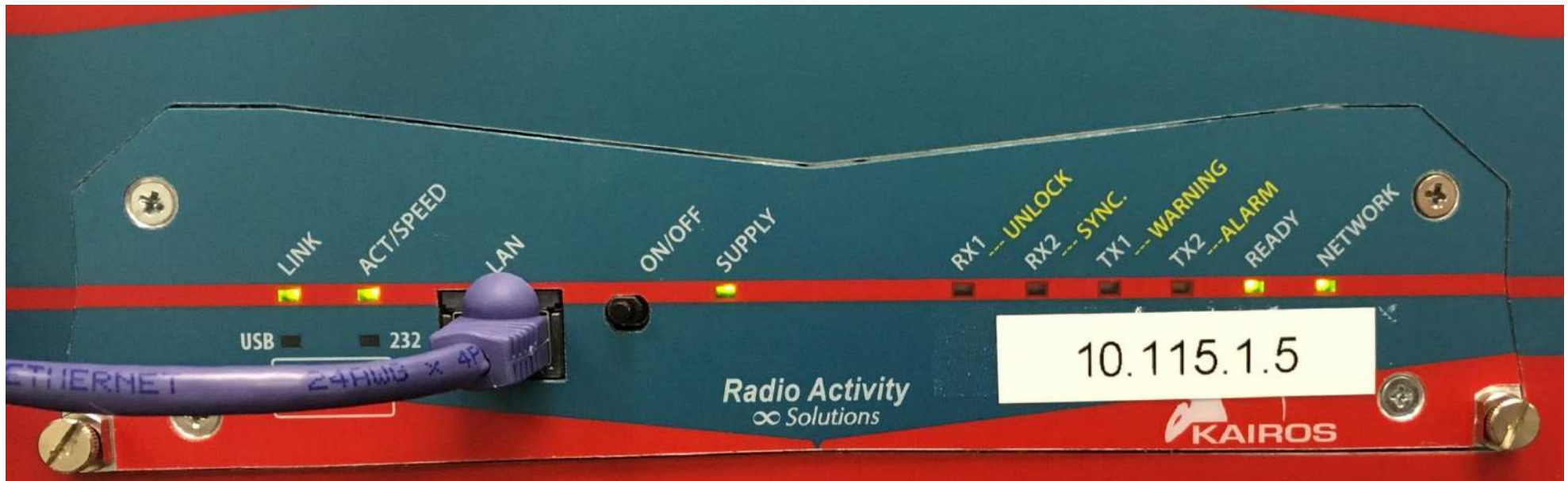
- ◆ Most issues are PTP-sync related

Kairos Troubleshooting



Kairos Troubleshooting

The Link and Act/Speed lights tell you the Layer-1/2 status of the LAN connection.

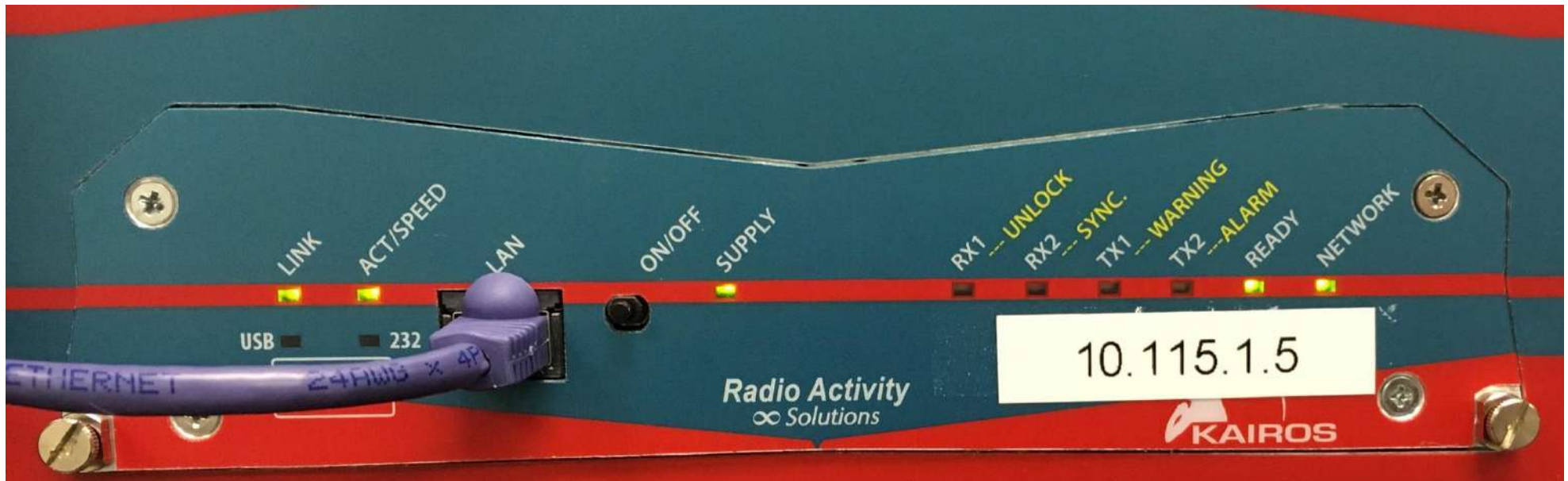


An RX1 LED that is blinking Green means the internal timing sync is satisfied.

The NETWORK LED tells you about the status of this Kairos' view of the Kairos Network.

Kairos Troubleshooting

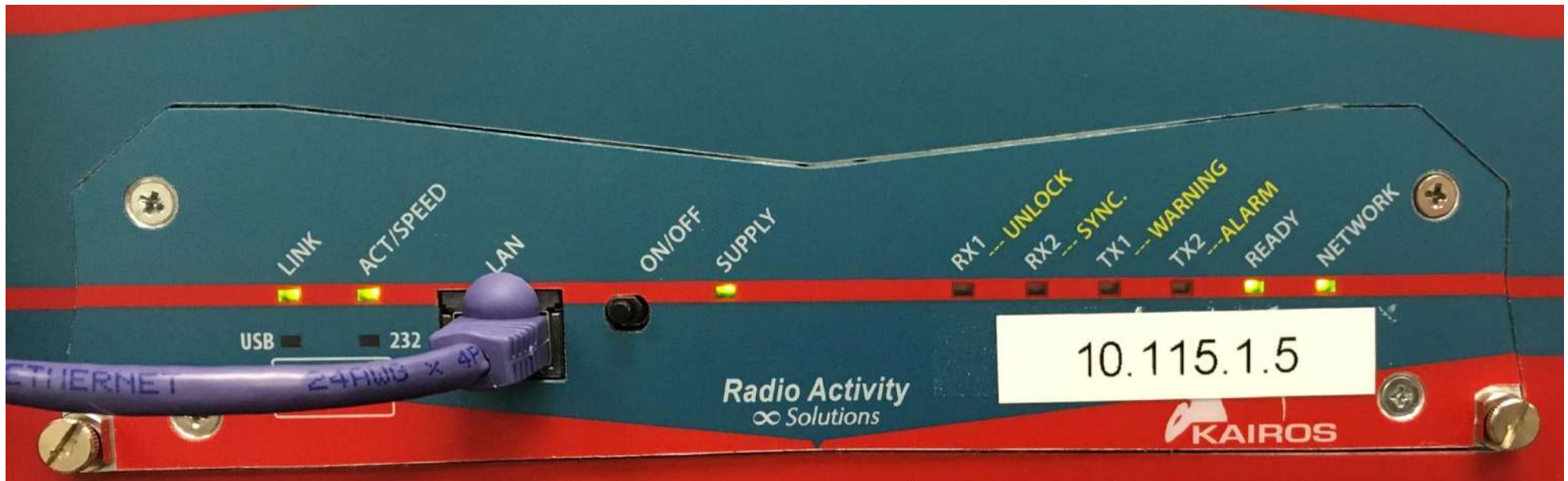
Link is always green when connected to the IP network.
ACT/SPEED will be blinking with network activity and steady without activity .



If RX1 is blinking Green, Kairos is synced and timing is good.

If NETWORK is blinking Green, Kairos is registered to the Master.

Kairos Troubleshooting



The RX1 lights should blink in sync across the network.

The NETWORK lights may not blink in sync with one another.

Kairos Troubleshooting

◆ DMR Packets out of window

KAIROS Overall Status - KAIROS <Slave2>

TRX Status

DSP Ready	TRX Active
Cibr Running	Cibr OK
M, RX Fail	D, RX Fail
Interrupts from PLD	
SQ	Analog PTT
TCS/DPL	Digital PTT
RX DMR TS A	TX DMR TS A
RX DMR TS B	TX DMR TS B
RX P25	TX P25

Features Status

- SIMULCAST Features
- DMR Features
- ANALOG Features
- ETSI Tier III Features
- NETCONTROL Access
- SNMP Features
- POCSAG Features
- MULTITONE TCS Features
- P25 Features
- TX Features
- SIP Features
- Amateur Radio Features
- External Raw Access
- Audio from Web

Commands

- Unlock SQ
- Unlock TCS/DPL
- Start Transmission
- Disable TX
- Line 2 Output Signal
- Local TRX Test
- Disable Digital Squelch

Synchronization Status

PPS Signal from GPS	Present	Valid	Lock
PPS Signal from PTP	Present	Valid	Lock
External PPS Signal	Present	Valid	Lock
Superaudio Tone	Present	Valid	Lock

Synchronization from RF Signal or 4FSK

Synchronization from Internal Reference

DSP Correctly Synchronized

AF Lines Status

AF to DMR Codecs	TS A	TS B	
DMR Codecs to AF	TS A	TS B	
Output Signalling	Line 1	Line 2	IP Line
Input Signalling	Line 1	Line 2	IP Line

Emergency Self-Repeating Mode

Registered to Master

Promoted to Master for Emergency

Vocoders Status

Vocoder 1	Vocoder 2
-----------	-----------

Clocks Status

TX PLL Lock	RX PLL Lock
DSP <=> PLD Communication	

1+1 Status

1+1 Node	Link between Nodes
----------	--------------------

Last role change: --

DSP Measures

Last DSP Startup: 2018-10-30 12:14:35

DMR Packets Out of Window	0
ANA Packets Out of Window	0
Safety Margin for DMR Packets	2
Safety Margin for ANA Packets	0
Timing Error [µs]	4,660
PPS Position [µs]	51,994

RX Measures

Peak Deviation [Hz]	4391
Estimated SINADp [dB]	2.8
Offset of received carrier [Hz]	63

Analog Measures

Input Supply Voltage [V]	13.4
TX Temperature [°C]	22
TX Input Current [A]	N/A
Forward Power [W]	N/A
Reflected Power [W]	N/A
S W R	N/A

DMR Status

Internal Second/Timeslot	8	278
Last Received Timeslot	TS A	TS B
Frequency offset rx [Hz]	62	0
Time offset rx [ms]	-306	0
Error Vector	0.042	0.000
Last Received Color Codes	173	0
Last Transmitted Data Types	1	0
RSSI Main [dBm]	9	9
RSSI Diversity [dBm]	-127.1	-127.4
	-131.0	-129.4

UHF 450+520 MHz ITU Region 2 Band **MULTIPROTOCOL DMR TIER II NODE** **SLAVE BASE STATION**

S/N: 500KA5616 Base Station Role: BROADCASTER Equipment ID: 0x08409150 10.115.1.6

Kairos Troubleshooting

KAIROS Overall Status - KAIROS <Slave2>

TRX Status

DSP Ready	TRX Active
Cibr Running	Cibr OK
M, RX Fail	D, RX Fail
Interrupts from PLD	
SQ	Analog PTT
TCS/DPL	Digital PTT
RX DMR TS A	TX DMR TS A
RX DMR TS B	TX DMR TS B
RX P25	TX P25

Synchronization Status

PPS Signal from GPS	Present	Valid	Lock
PPS Signal from PTP	Present	Valid	Lock
External PPS Signal	Present	Valid	Lock
Superaudio Tone	Present	Valid	Lock
Synchronization from RF Signal or 4FSK			Lock
Synchronization from Internal Reference			Lock

DSP Correctly Synchronized

DSP Measures

Clear Packets Counters

Last DSP Startup:
2018-10-30 12:14:35

DMR Packets Out of Window	0
ANA Packets Out of Window	0
Safety Margin for DMR Packets	2
Safety Margin for ANA Packets	0
Timing Error [µs]	4.660
PPS Position [µs]	51.594

Features Status

- SIMULCAST Features**
- DMR Features**
- ANALOG Features**
- ETSI Tier III Features**
- NETCONTROL Access**
- SNMP Features**
- POCSAG Features**
- MULTITONE TCS Features**
- P25 Features**
- TX Features**
- SIP Features**
- Amateur Radio Features
- External Raw Access
- Audio from Web

AF Lines Status

AF to DMR Codex	TS A	TS B	
DMR Codex to AF	TS A	TS B	
Output Signalling	Line 1	Line 2	IP Line
Input Signalling	Line 1	Line 2	IP Line

Emergency Self-Repeating Mode
Registered to Master
Promoted to Master for Emergency

RX Measures

Peak Deviation [Hz]	4391
Estimated SINADp [dB]	2.8
Offset of received carrier [Hz]	63

Commands

Set

- Unlock SQ
- Unlock TCS/DPL
- Start Transmission
- Disable TX
- Line 2 Output Signal
- Local TRX Test
- Disable Digital Squelch

Vocoders Status

Vocoder 1	Vocoder 2
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Analog Measures

Input Supply Voltage [V]	13.4
TX Temperature [°C]	22
TX Input Current [A]	N/A
Forward Power [W]	N/A
Reflected Power [W]	N/A
S W R	N/A

Clocks Status

TX PLL Lock	RX PLL Lock
DSP <=> PLD Communication	

DMR Status

Internal Second/Timeslot	8	278
	TS A	TS B
Last Received Timeslot	62	0
Frequency offset rx [Hz]	-306	0
Time offset rx [ms]	0.042	0.000
Error Vector	173	0
Last Received Color Codes	1	0
Last Transmitted Data Types	9	9
RSSI Main [dBm]	-127.1	-127.4
RSSI Diversity [dBm]	-131.0	-129.4

1+1 Status

Force to SPARE

1+1 Node	Link between Nodes
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Last role change: --

Close

UHF 450÷520 MHz ITU Region 2 Band

MULTIPROTOCOL DMR TIER II NODE

SLAVE BASE STATION

S/N: 500KA5616

Base Station Role: BROADCASTER

Equipment ID: 0x08409150

10.115.1.6

Kairos Troubleshooting

KAIRO Overall Status - KAIROS <Slave2>

TRX Status

DSP Ready	TRX Active
Cbr Running	Cbr OK
M. RX Fail	D. RX Fail
Interrupts from PLD	
SQ	Analog PTT
TCS/DPL	Digital PTT
RX DMR TS A	TX DMR TS A
RX DMR TS B	TX DMR TS B
RX P25	TX P25

Synchronization Status

PPS Signal from GPS	Present	Valid	Lock
PPS Signal from PTP	Present	Valid	Lock
External PPS Signal	Present	Valid	Lock
Superaudio Tone	Present	Valid	Lock
Synchronization from RF Signal or 4FSK			Lock
Synchronization from Internal Reference			Lock

DSP Correctly Synchronized

DSP Measures

Clear Packets Counters

Last DSP Startup:
2018-10-30 12:14:35

DMR Packets Out of Window	0
ANA Packets Out of Window	0
Safety Margin for DMR Packets	2
Safety Margin for ANA Packets	0
Timing Error [µs]	0.840
PPS Position [µs]	44.127

Features Status

- SIMULCAST Features**
- DMR Features**
- ANALOG Features**
- ETSI Tier III Features**
- NETCONTROL Access**
- SNMP Features**
- POCSAG Features**
- MULTITONE TCS Features**
- P25 Features**
- TX Features**
- SIP Features**
- Amateur Radio Features**
- External Raw Access**
- Audio from Web**

AF Lines Status

AF to DMR Codes	TS A	TS B	
DMR Codes to AF	TS A	TS B	
Output Signalling	Line 1	Line 2	IP Line
Input Signalling	Line 1	Line 2	IP Line

Emergency Self-Repeating Mode
Registered to Master
Promoted to Master for Emergency

RX Measures

Peak Deviation [Hz]	4466
Estimated SINADp [dB]	2.9
Offset of received carrier [Hz]	27

Commands

Set

- Unlock SQ
- Unlock TCS/DPL
- Start Transmission
- Disable TX
- Line 2 Output Signal
- Local TRX Test
- Disable Digital Squelch

Vocoders Status

Vocoder 1	Vocoder 2
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Analog Measures

Input Supply Voltage [V]	13.4
TX Temperature [°C]	22
TX Input Current [A]	N/A
Forward Power [W]	N/A
Reflected Power [W]	N/A
S W R	N/A

Clocks Status

TX PLL Lock	RX PLL Lock
DSP <=> PLD Communication	

DMR Status

Internal Second/Timeslot	2	83
Last Received Timeslot	TS A	TS B
Frequency offset rx [Hz]	62	0
Time offset rx [ms]	-306	0
Error Vector	0.042	0.000
Last Received Color Codes	173	0
Last Transmitted Data Types	1	0
RSSI Main [dBm]	9	9
RSSI Diversity [dBm]	-128.0	-127.8
	-131.0	-132.4

1+1 Status

Force to SPARE

1+1 Node	Link between Nodes
----------	--------------------

Last role change: --

Close

UHF 450÷520 MHz ITU Region 2 Band

MULTIPROTOCOL DMR TIER II NODE

SLAVE BASE STATION

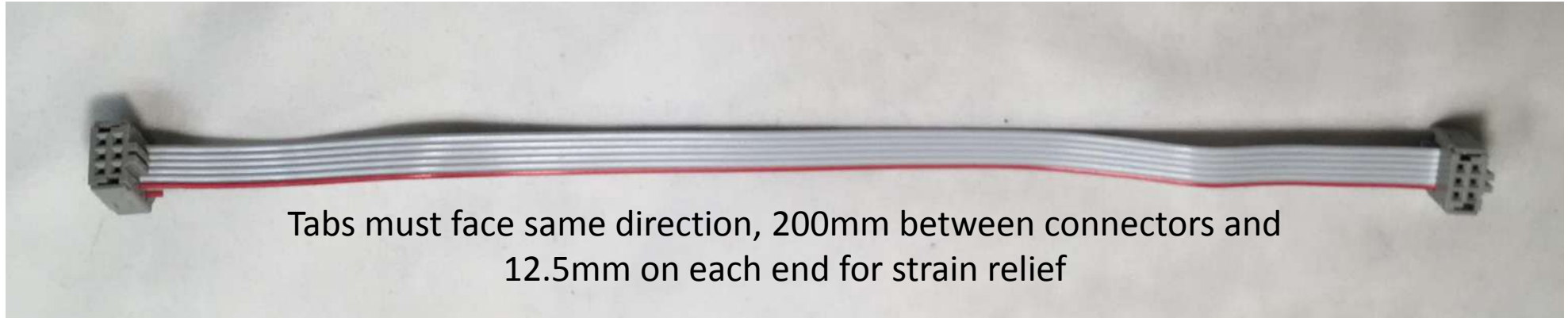
S/N: 500KA5616

Base Station Role: BROADCASTER

Equipment ID: 0x08409150

10.115.1.6

Kairos Troubleshooting



Kairos and the DMR Standard

- ◆ Groups are not supported
 - While Kairos passes group calls, it does not discern them
 - There is no console interface to support group calling
 - There will be provision for group calling soon

The image features the JVCKENWOOD logo in white, bold, uppercase letters, centered on a blue background. The background is composed of several overlapping geometric shapes in different shades of blue, creating a modern, abstract design. The shapes are primarily triangles and quadrilaterals, with some areas in a lighter blue and others in a darker blue. The overall composition is clean and professional.

JVCKENWOOD