Preliminary results from the µ-RWELL Test Beam for the Phase-II upgrade of LHCb

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> LNF – INFN ¹ Bari – INFN ² CERN ³

 $3^{\rm rd}$ DRD1 Collaboration Meeting, Dec $12^{\rm th}$ 2024



17=48 18

LHCb upgrade II (Run 5-6)

LHCb muon RUN 5-6 option: μ -RWELL \rightarrow Detector requirements:

- Rate up to **1 MHz/cm²** on detector single gap
- Rate up to **700kHz** for FEE channel
- Efficiency (4 gaps) > **96% within BX** (25 ns)
- Stability up to 1 C/cm² accumulated charge in 10y of operation

Detector size & quantity (4 gaps/chamber)

• R1 + R2 of M2-M5: **576 det.**, size 30x25 to 74x31 cm², **90 m² det**





M2 station - max rate (kHz/cm²)



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The **µ-RWELL**



The low-rate layout: Single Resistive Layout (SRL)



- Grounding at the perimeter of the active area
- Limitation for large area: detector response depends on particle incidence point
- Limited rate capability





Single Resistive Layout (SRL)

Different primary ionization ⇒ Rate Cap._{m.i.p.} = 3×Rate Cap._{X-ray}

High-rate layouts: principle of operation

To overcome the **intrinsic rate limitations** of the Single Resistive Layout, it is necessary to introduce a **high-density grounding network** for the resistive stage (DLC).



Single Resistive Layout (SRL)



Segmentation of the DLC with conductive microstrips/dots with a typical pitch of 1cm: a sort of **tiling** of the active area using a set of smaller SRL.

The PEP-DOT **µ-RWELL**

DLC-GND	Dead Zone	GND width	Insulation	DOCA
pitch [mm]	[mm]	[mm]	gap [mm]	[mm]
9	1.3 (1.6%)	0.767	0.175	0.535





- The most recent high rate layout: **P**atterning-**E**tching-**P**lating
- The DLC ground connection is established by creating **metalized vias from the top Cu layer through the DLC**, down to the pad-readout of the PCB
- The dead zone is $\sim 2\%$



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Different from the old PEP-Groove! Pay attention to the HR Layout in use!

12/12/24

The PEP-DOT μ -RWELL – M2R1 prototypes



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µ-RWELL + GEM preamplification

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Development of μ -RWELL detectors for the upgrade of the tracking system of CMD-3 detector



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ARTICLE INFO	ABSTRACT
Keywords: Tracking detectors Micro-RWELL Micro-pattern gas detectors	An upgrade of tracking system of Cryogenic Magnetic Detector (CMD-3) is proposed using microresistive WELL technology. CMD-3 is a general purpose detector operating at the VEPP-2000 collider at Budker Institute of Nuclear Physics and intended for studies of light vector mesons in the energy range between 0.3 GeV and 2 GeV. The new subsystem consists of double-layer cylindrical detector and the end-cap discs. Two prototypes, micro-RWELL and micro-RWELL-GEM were built and tested. Gas amplification of micro-RWELL detector was measured with several gas mixtures and maximum gain between 20000 and 30000 was observed. However, maximum gain is fluctuating from measurement to measurement by a factor of 2 and thus a safety margin of 2-3 is needed to provide reliable operation of the device. In order to increase the signal GEM was added to micro-RWELL, new prototype was tested with the same gas mixtures and gains above 10 ^o have been demonstrated. Time resolution achieved for both prototypes are 7 ns for micro-RWELL ad 1 ns for micro-RWELL-GEM.

L. Shekhtman, Nuclear Inst. and Methods in Physics Research, A 936 (2019) 401-404

See also **E. Sidoretti's talk**: Test beam first preliminary results on the GEM-uRWELL prototypes for ePIC endcap tracking



In collaboration with Rome2 ePIC group

Gas gain measurement – w/X-rays

VERY PRELIMINARY: OCT'24



A very stable detector: it doesn't show any hint of instabilities even at **60k**. This measurement has been done before the test beam so there were no reason to stress the detector above 60k.

Gas gain measurement – w/X-rays

VERY PRELIMINARY: OCT'24



It is possible to **extrapolate** the total gas gain for different WELL HV values. The Hybrid gas gain should be considered **preliminary**. The measurement will be **done again** soon as possible, when the test beam setup will be shipped back.

Test Beam setup

Gas used: Ar/CO₂/CF₄ 45/15/40





Trackers: 10×10cm² - 1.2mm strip R/O (Capacitive Sharing) Reference: 10×10cm² - 9×9mm² pad R/O **HYBRID:** 10×10cm² - 9×9mm² pad R/O M2R1: 30×25cm², instrumented 15×13cm² - 9×9mm² pad R/O

TB area: PS-T10 w/ 5 GeV muons

A special thanks to INFN LNF, Rome2, and Bari LHCb groups for the support during the beam test.

Test Beam setup

Gas used: Ar/CO₂/CF₄ 45/15/40

HYBRID: GEM+µ-RWELL

TRD_Y REF_D H TRD_X	YB_D M4 HYB_U	4 M3	M2	RE M1	F_U TR	TRU_X U_Y	ζ.
		BEAN	1				
EE: 16 FATIC FEE b	oards						



F

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FATIC3 block diagram



Preamplifier features:

- CSA operation mode
- Input signal polarity: positive & negative
- Recovery time: adjustable

CSA mode:

- Programmable Gain: 10 mV/fC ÷ 50 mV/fC
- Peaking time: 25 ns, 50 ns, 75 ns, 100 ns

Timing branch:

- Measures the arrival time of the input signal
- Time jitter: 400 ps @ 1 fC & 15 pF (Fast Timing MPGD)

Charge branch:

- Acknowledgment of the input signal
- Charge measurement: dynamic range > 50 fC, programmable charge resolution

Dataset

- HV scan M2R1 e HYB (THR 7/6, 6/5, 5/4 fC)
 - A single point M2R1 650V, HYB @535/460 @THR = 7/3.5
 - HYB: few points at high gain, THR 4/3, WELL@[425, 470, 500, 535, 550], GEM @[460, 480, 500]
- M2R1 e HYB: Drift scan M2R1@[650V], HYB@[gem535/well450]
- HYB: Transfer scan [3, 3.5, 4, 4.5, 5, 5.5] WELL @535, GEM @[350, 400, 450]
 - HYB: Transfer scan [0.5-7.5] WELL @[470, 500] GEM@460
- HYB: 3mm scan: HV scan @THR6/5 with Ed=0, Et=3.5, simulating an RWELL w/ drift gap 3mm
- Random trigger @ THR 7/6, 6/5, 5/4, 7.5/3
- M2R1 High statistic run (200k evt) x radiography
- HYB: Scan for different WELL HV Ed=3.5, Et=4.5
 - WELL @425, GEM @[0-510]
 - WELL @470, GEM @[0-510]
 - WELL @500, GEM @[0-510]
 - WELL @535, GEM @[0-510]
 - WELL @550, GEM @[0-510]
 - WELL @565, GEM @[0-500]

M2R1 vs HYBRID – Efficiency

VERY PRELIMINARY: NOV'24

All data: Ar/CO₂/CF₄ 45/15/40

HYB U



M3 vs HYB_U

A plateau >98% is reached for a gas gain above 8000.

M2R1 vs HYBRID – Efficiency

VERY PRELIMINARY: NOV'24

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A **prophecy** by Gianni just before the test:

M2R1 = 5ns HYB = 3.5ns

VERY PRELIMINARY: NOV'24

All data: Ar/CO₂/CF₄ 45/15/40



Time reference: one of the scintillator of the trigger (σ_t <1ns) σ_t : gauss fit core of the Δ_t distribution

- Why **HYB** better than **M2R1** at the **same gain**? Maybe a better efficiency on the **first cluster**
- Why the **families** for different HV_WELL? "**Biwell effect**"

VERY PRELIMINARY: NOV'24

All data: Ar/CO₂/CF₄ 45/15/40



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better efficiency on the first clusterWhy the families for different HV WELL? "Biwell effect"

27 nov 2024 VERY PRELIMINARY: NOV'24

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M2R1 – Efficiency in 25ns



12/12/24

m. wivrumnvtti FILAN O HERFFF CAAL MANIN MIANUMUNIA LAADIG



Ionisation

The particle ionises in both the drift gap and the transfer gap



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GEM or RWELL

Electron from the drift gap \rightarrow amplified from the **GEM** (gain 20) Electrons from the transfer gap \rightarrow amplified by the **WELL** (gain 2000)



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GEM or RWELL

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GEM + RWELL

After a drift time in the "Transfer gap", the electrons preamplified by the GEM reach the RWELL, and get amplified again.

 \rightarrow Total gas gain 40'000



M2R1 vs HYBRID – Efficiency in 25ns

VERY PRELIMINARY: NOV'24



The fact that the high gain curves have a lower plateau is explained by the **"biwell" effect**. Of course the magnitude of this **effect depends** on the geometry of the detector (the **transfer** field and gap) and the **FEE threshold**.

M. Giovannetti - LHCb u-RWELL test beam preliminary results

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Time of all hits - M2R1

VERY PRELIMINARY: NOV'24



Time of all hits - M2R1 vs HYB



Both M2R1 and Hybrid detectors show this shoulder @50ns delay.

This effect is **currently under investigation.** The current hypotesis is that is similar to an effect already seen on M2R1 GEM detectors, solved adding a **blocking capacitor** to the electrode.

Next steps: study the **topology** of the events (dependancy on charge, position, cluster size, 1^{st} and 2^{nd} neighbor pads)



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Fig. 4.14: time difference between fastest hit and each other.

D. Raspino, Ph.D. thesis (2006), "Il rivelatore a tripla GEM per il sistema di muoni dell'esperimento LHCb"

Summary

Final **M2R1 size** $30 \times 25 \text{cm}^2$ - 4 µ-RWELL tested:

- @ gas gain 4000: efficiency 95%, σ_T 10ns
- **Stable** operation at **gain 10k** (stable), maximum gain above 20k (some instabilities)
- While good for every day use, the LHCB requirement is the efficiency in a 25ns time window:
- \rightarrow for a $\mu\text{-RWELL:}$ eff 25ns >90% @ gas gain >10k

Test of **HYBRID GEM+µ-RWELL** 10x10cm²: large gain (up to 90k) and very stable operation

- Efficiency comparable to a µ-RWELL, for same gas gain
- σ_T slightly better (under investigation, maybe due to the fact that there are two ampl. Stages)
 - Best result: $\sigma_T = 3.8$ ns (core) for gain 30'000, GEM=480V, WELL=535V, Ed=3.5kV/cm, Et=4.5kV/cm
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Beam test nov'24: **HYBRID µ**-**RWELL** tested for **timing** (us) and for **2D tracking** (CC and uTPC) (Epic group).

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Outlook

TB analysis ongoing:

- study of the "Biwell effect"
- Tracking implementation for studying the PEP-DOT area and pad-pad crosstalk effects
- Drift scan and Transfer scan analysis

Hybrid optimisation:

- Reduce the **Transfer Gap to 2mm** (and for LHCb also the drift gap to 3mm)
- Study of the "50ns events" \rightarrow Introduction of the blocking capacitor

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Spare



The µ-RWELL: detector scheme

The μ -RWELL is a Micro Pattern Gaseous Detector (MPGD) composed of only two elements: the μ -RWELL_PCB and the cathode. The core is the μ -RWELL_PCB, realized by coupling three different elements:



Applying a suitable voltage between the **top Culayer and the DLC** the WELL acts as a **multiplication channel for the ionization** produced in the conversion/drift gas gap.



a standard readout PCB

Rate capability vs spot-size & detector size

Comparison between a **model** of the resistive stage and **measurements** of the rate capability for SRL.

1. detectors with same size (d) but different resistivity exhibit a rate capability scaling as the inverse of their resistivity.

2. for the SRL, increasing the active area from 10x10 cm2 to 50x50 cm2 the rate capability should go down few kHz/cm².

3. By using a **DLC** ground **sectoring every 10 cm**, large (50x50cm2) detectors could achieve **rate capability up to 100kHz/cm**² (with X-ray).

Different primary ionization ⇒ Rate Cap._{m.i.p.} = 3×Rate Cap._{X-ray}



µ-RWELL + GEM – gas gain

3 different gains for the µ-RWELL

3 different detectors



A very stable detector: it doesn't show any hint of instabilities even at 60k. We stopped because the FEE will surely saturate at that point Planned to be tested as soon as possible with APV25. Goal: space resolution with a COMPAS-like readout.

12/12/24

GEM gain

@ 450V ≈ 20

Hybrid – Ed Et scan

VERY PRELIMINARY: OCT'24



Hybrid – gas gain







- Step 0 Detector **PCB design** @ LNF + CERN-MPT
- Step 1 CERN_INFN **DLC sputtering machine** @ CERN (+INFN)
- In operation since Nov. 2022
- Production by LNF-INFN crew
- Step 2 Producing readout PCB by ELTOS
- pad/strip readout



- Step 3 **DLC patterning** by ELTOS
- photo-resist \rightarrow patterning with BRUSHING-machine
- Step 4 **DLC foil gluing** on PCB by ELTOS
- Large press available, up to 16 PCBs workable at the same time
- Step 5 Ground network connections creation by CERN
 PEP layout: Cu Patterning → PI Etching → Cu Plating

Step 6 - Amplification stage patterning by CERN

- Cu amplification holes image and HV connections by Cu etching
- PI etching \rightarrow plating \rightarrow amplification-holes

Step 7 – Electrical cleaning and detector closing @ CERN $% \left({{{\bf{F}}_{{\rm{B}}}} \right)$



This research has been supported by the E.U. Project AIDAInnova Task 7.3 (European Union's Horizon 2020 Research and Innovation programme, grant agreement N.101004761) 12/12/24 M. Giovannetti - LHCb u-RWELL test beam preliminary results

Update on the DLC Sputtering



The **CID** (CERN-INFN-DLC) sputtering machine, a **joint project between CERN and INFN**, is used for preparing the **base material of the detector**. The potential of the DLC sputtering machine is:

- Flexible substrates up to 1.7×0.6m²
- Rigid substrates up to 0.2×0.6m²

In **2023**, the activity on CID focused on the **tuning** of the **machine on small foils: good** results in terms of **reproducibility and uniformity**.

In **2024**, the challenge is the **sputtering of large foils**:

- **DLC+Cu** sputtering on 0.8×0.6m² successfully done (May/June 2024)
- **DLC on 1.7 \times 0.6m^2 large 0/50/0 Apical foils successfully done (June 2024)**
- **DLC on 1.7×0.6m**² large 5/50/0 Apical foils successfully done (July 2024)







Many thanks to the CID team!!



2023 – 10x10 co-production pilot test





-/DDG/lavori/AIDAinnova/2023-12_prepreg_thick/analys

10x10 and M2R1 - summary





The gas gain calibration curve are very similar, thus the process for creating the amplification stage is stable and doesn't depend on the size of the detector.

Correlation: the max-gain increases with the DLC resistivity.

It seems that large size detector maximum gain is lower that the 10x10 one.

Eventi in ritardo di 50ns - T vs Q

HYB 500/510 gain 20'000 DAQ_20241124_183044



Eventi in ritardo di 50ns - T vs Q

HYB 470/500 gain 9000 DAQ_20241126_011150



Eventi in ritardo di 50ns - Mappa HYBRID

HYB 500/510 gain 20'000 DAQ_20241124_183044

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Cp17 Cp18 Cp18 <th< td=""><td>(66)</td><td>(67)</td><td>(68)</td><td>(69)</td><td>(70)</td><td>(71)</td><td>(72)</td><td>(73)</td><td>(74)</td><td>(75)</td><td>(76)</td></th<>	(66)	(67)	(68)	(69)	(70)	(71)	(72)	(73)	(74)	(75)	(76)
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Cp17	Cp17	Cp17	Cp17	Cp17	Cp17	Cp17	Cp17	Cp17	Cp17	Cp17
(59) (57) <th< td=""><td>M3 F20</td><td>M3 F20</td><td>M3 F20</td><td>M3 F20</td><td>M3 F20</td><td>M3 F20</td><td>M3 F20</td><td>M3 F20 8x6</td><td>M3 F20 9x6</td><td>M3 F20 10x6</td><td>M3 F20</td></th<>	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20 8x6	M3 F20 9x6	M3 F20 10x6	M3 F20
Cp17 Cp17 Cp17 Cp17 Cp17 Cp18 Cp18 <th< td=""><td>(55)</td><td>(56)</td><td>(57)</td><td>(58)</td><td>(59)</td><td>(60)</td><td>(61)</td><td>(62)</td><td>(63)</td><td>(64)</td><td>(65)</td></th<>	(55)	(56)	(57)	(58)	(59)	(60)	(61)	(62)	(63)	(64)	(65)
M3 F20 M3 F20<	Cp17	Cp17	Cp17	Cp17	Cp17	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18
Action Action<	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20
Cp18 Cp19 Cp19 <th< td=""><td>(44)</td><td>(45)</td><td>(46)</td><td>(47)</td><td>(48)</td><td>(49)</td><td>(50)</td><td>(51)</td><td>(52)</td><td>(53)</td><td>(54)</td></th<>	(44)	(45)	(46)	(47)	(48)	(49)	(50)	(51)	(52)	(53)	(54)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18
1.2. 2.2. 3.2. 4.2. 3.2. 4.2. 5.2. 6.2. 4.2. 3.2. 4.2. 5.2. 6.2. 7.2. 8.2. 9.2. 10.2. 11.2. 11.2. 11.2. 11.2. 11.2. 12.2. 2.2. 10.2. 11.2. 12.2. 12.2. 12.2. 12.2. 12.2. 12.2. 12.2. 12.2. 12.2. 12.2. 12	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20 8x4	M3 F20	M3 F20 10x4	M3 F20
Cprite Cprite<	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20 8x3	M3 F20	M3 F20 10x3	M3 F20
Cp18 Cp18 Cp18 Cp19 Cp19 <th< td=""><td>(22)</td><td>(23)</td><td>(24)</td><td>(25)</td><td>(26)</td><td>(27)</td><td>(28)</td><td>(29)</td><td>(30)</td><td>(31)</td><td>(32)</td></th<>	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Cp18	Cp18	Cp18	Cp18	Cp19						
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	M3 F20	M3 F20	M3 F20 3x2	M3 F20	M3 F20 5x2	M3 F20 6x2	M3 F20 7x2	M3 F20 8x2	M3 F20 9x2	M3 F20 10x2	M3 F20 11x2
Cp19 Cp19 <th< td=""><td>(11)</td><td>(12)</td><td>(13)</td><td>(14)</td><td>(15)</td><td>(16)</td><td>(17)</td><td>(18)</td><td>(19)</td><td>(20)</td><td>(21)</td></th<>	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19
(i) (i) <td>111</td> <td>21</td> <td>3x1</td> <td>4x1</td> <td>5x1</td> <td>6x1</td> <td>71</td> <td>8x1</td> <td>9x1</td> <td>10x1</td> <td>11x1</td>	111	21	3x1	4x1	5x1	6x1	71	8x1	9x1	10x1	11x1
Cp19 Cp19 <th< td=""><td>(0)</td><td>(1)</td><td>(2)</td><td>(3)</td><td>(4)</td><td>(5)</td><td>(6)</td><td>(7)</td><td>(8)</td><td>(9)</td><td>(10)</td></th<>	(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ento 5_1: REF_U: pad 2x9 (89) Mscilo Chip_9bichl_2 isbuarpe 1504 of dt = -140.62	Cp19 M3 E20	Cp19 M3 E20	Cp19 M3 E20	Cp19 M3 E20	Cp19 M3 E20	Cp19 M3 E20	Cp19 M3 E20	Cp19 M3 E20	Cp19 M3 E20	Cp19 M3 E20	Cp19 M3 E20
ento 5_1: Immagini REF_U: Journal DDGStyleLi Journal DDGStyleL	10 120		103720	_ M3 F20	- M3 - 20	M3 F 20	- WO - 20	M3 - 20	- M3 - 20	M3 - 20	W3 - 20
REF_U: 2024-12-04 2024-12-04 2024-12-04 DDGStyleLi hyb glovannett glovannett glovannett glovannett b.h gasgain pad 2x9 (89) Msc_1p. Chip_9 b.chl_2 i.bugamp= 1504 i.temp	ento 5_	1:									
pad 2x9 (89) Msc_1o Chip_9 ochl_2 ibuanp= 1504 dt= -140.62											
pad 2x9 (89) Msc_1 Chip_9 chl_2 amp= 1504 dt= -140.62	(C)_0:										
pad 2x9 (89) MSC_1 Chip_9 Chi_2 mamp= 1504 dt= -140.62			003	Mag. 4	Cha	0			EQ4	44	140 62
	pag 2		(69)	msc_1	cnrb_	9 cnt_	4 1200	amb= .	1504	ut= -	140.02
	inting t		mvdS:::	constru	ictor>:	Detett	ing can	vas wu	in same	name :	REF_U
Theng in Creanvast constructors: Detering canvas with same name: REF_U	iyo_0:										
Hyb_U:											
Hyb Us Hyb Us Video	pad 1	.1×10	(109)	Msc	_3 Ch	ip_16	chl_24		amp= 83	2 d	t = -10
Hyb U: pad 11x10 (109) Msc_3 Chtp_16; chl_24 ₂₅₆₅ amp= 832 dt= ~10		.x9 ((89)	Msc_3	Chip_	16 chl	_26	amp=	= 1504	dat dt=	-143
Hyb_U: Video pad 11x10 (109) Msc_3 Chip_16 chl_2425ns amp= 832 dt=210 pad 2x9 (89) Msc_3arChip_16 chl_26uncorreamp= 1504 chr dt=1-143.	pad 2		(71)	Msc_3	Chip_	17 chl	_20	amp:	= 480	dt=	-65.62
Hyb U: Tyleo pad 11x10 (109) Msc_3 Chtp_16.chl_2425ns amp=.832 dt=o-10 pad 2x9 (89) Msc_3a:Chtp_16.chl_26uncorreamp=.1504.elst dt=o-143; pad 6x7 (71) Msc_3.p.Chtp_17chl_20 ed.cp.amp=_480dt=o-65.62	pad 2 pad 6)XI (
<pre>Http://teo pad 11x10 (109) Msc_3 Chip_16 chl_24.55 amp= 832 dt= 10 pad 2x9 (89) Msc_3 Chip_16 chl_26cm amp= 1504 clar dt= 143. pad 6x7 (71) Msc_3 Chip_17chl_20 edcpamp= 480s.dt= 65.62 pad 6x7 (71) Msc_3 Chip_17chl_20 edcpamp= 480s.dt= 65.62</pre>	pad 2 pad 6) / X									
<pre>Http://www.stransistactors.betetting tanvas with same name: REF_0 Hyb_U: pad 11x10 (109) Msc_3 Chip_16 chl_24 amp= 832 dt= 10 pad 2x9 (89) Msc_3 Chip_16 chl_26 amp= 1504 dt= 143. pad 6x7 (71) Msc_3 Chip_17 chl_20 amp= 480 dt= 65.62 Filing in <tcanvas::constructors: <="" canvas="" deleting="" hyb_u="" name:="" pre="" same="" with=""></tcanvas::constructors:></pre>	pad 2 pad 6 ning i	.n <t<u>Ca</t<u>	anvas:::	Const <u>ru</u>	ctor>:	Deleti	ng can	vas wii	th same	name:	Hyb U
<pre>http://www.secanvas.constructors.betering canvas with same hame: kEF_U Hyb_U: pad 11x10 (109) Msc_3 Chip_16 chl_24.sns amp=.832 dt=-10 pad 2x9 (89) Msc_3 Chip_16 chl_26.mcorr amp=.1504 clat dt=-143: pad 6x7 (71) Msc_3 Chip_17 chl_20 dep amp=.480 ns. dt=-65.62 rning in <tcanvas::constructors: canvas="" d:<="" deleting="" hyb_u="" name:="" pre="" ref="" same="" with=""></tcanvas::constructors:></pre>	pad 2 pad 6 ning i REF D-	.n <tca< td=""><td>anvas::</td><td>Constru</td><td>ictor>:</td><td>Deleti</td><td>ng can</td><td>vas wit</td><td>th same</td><td>name:</td><td>Hyb_U</td></tca<>	anvas::	Constru	ictor>:	Deleti	ng can	vas wit	th same	name:	Hyb_U
<pre>http:// canvas.constructors. betettig canvas with same name: kEF_0 hyb_U- pad 11x10 (109) Msc_3 Chip_16 chl_24 amp= 832 dt= -10 pad 2x9 (89) Msc_3 Chip_16 chl_26 amp= 1504 dt= -143. pad 6x7 (71) Msc_3 Chip_17 chl_20 constructors: Deleting canvas with same name: Hyb_U REF_D:</pre>	pad 2 pad 6 ning i REF_D:	.n <tca< td=""><td>invas::</td><td>Constru</td><td>ictor>:</td><td>Deleti</td><td>ng can</td><td>vas wit</td><td>th same</td><td>name:</td><td>Hyb_U</td></tca<>	invas::	Constru	ictor>:	Deleti	ng can	vas wit	th same	name:	Hyb_U
pad 11x10 (109) Msc_3 Chip_16 chl_24 amp= 832 dt= 10 pad 12x9 (89) Msc_3 Chip_16 chl_26 amp= 1504 att= 143 pad 6x7 (71) Msc_3 Chip_17 chl_20 amp= 480 att= 65.62 pad 6x7 (71) Msc_3 Chip_17 chl_20 amp= 480 att= 65.62 pring in TCanvas::Constructor>: Deleting canvas with same name: Hyb_U REF_D: Vampre amp= 1568 dt= 158 vanpre pad 2x10 (100) Msc_11 Chip_12 chip_12 amp= 1568 dt= 158	pad 2 pad 6 rning i REF_D:	.n <tca< td=""><td>anvas::</td><td>Constru</td><td>ictor>:</td><td>Deleti</td><td>ng can</td><td>vas wii</td><td>th same</td><td>name:</td><td>Hyb_U</td></tca<>	anvas::	Constru	ictor>:	Deleti	ng can	vas wii	th same	name:	Hyb_U

VERDE: biwell ROSSO: good BLU: delay BIANCO: doppio delay

					Hyb_U					
<u>F</u> ile <u>E</u> dit	<u>V</u> iew <u>C</u>	ptions <u>T</u> o	ols							H
1x11 (110)	2x11 (111)	3x11 (112)	4x11 (113)	5x11 (114)	6x11 (115)	7x11 (116)	8x11 (117)	9x11 (118)	10x11 (119)	11x11 (120)
Cp16	Cp16	Cp16	Cp16	Cp16	Cp16	Cp16	Cp16	Cp16	Cp16	Cp16
1x10	2x10	3x10	4x10	5x10	6x10	7x10	8x10	9x10	10x10	11x10
(99) Cp16	(100) Cp16	(101) Cp16	(102) Cp16	(103) Cp16	(104) Cp16	(105) Cp16	(106) Cp16	(107) Cp16	(108) Cp16	(109) Cp16
M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20
1x9 (88)	2x9	3x9 (90)	4x9 (91)	5x9	6x9 (92)	7x9	8x9 (95)	9x9 (96)	10x9 (97)	11x9 (99)
Cp16	Cp16	Cp16	Cp16	Cp16	Cp16	Cp17	Cp17	Cp17	Cp17	Cp17
M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20
(77)	(78)	(79)	(80)	(81)	(82)	(83)	(84)	(85)	(86)	(87)
Cp17	Cp17 M2 E20	Cp17	Cp17	Cp17	Cp17	Cp17	Cp17	Cp17 M2 E20	Cp17	Cp17
1x7	2x7	3x7	4x7	5x7	6x7	7x7	8x7	9x7	10x7	11x7
(66) Cp17	(67) Cp17	(68) Cp17	(69) Cp17	(70) Cp17	(71)	(72)	(73) Cp17	(74) Cp17	(75) Cp17	(76) Cp17
M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20
1x6	2x6	3x6	4x6	5x6	6x6	7x6	8x6	9x6	10x6	11x6
(35)	Cp17	Cp17	Cp17	Cp17	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18
M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20
(44)	(45)	(46)	(47)	(48)	(49)	(50)	(51)	(52)	(53)	(54)
Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18
114	2x4	3x4	4x4	5x4	6x4	7x4	8x4	9x4	10x4	11x4
(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)
M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	13 F20
1x3	2x3	3x3	4x3	5x3	6x3	7x3	8x3	9x3	10x3	11x3
(22) Cp18	(23) Cp18	(24) Cp18	(25) Cp18	(26) Cp19	(27 Cp1	(28) Cp19	(29 Cp1	(30) Cp19	(31) 2p19	(32) Cp19
M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F2	M3 F20	43 F2	M3 F20	<u>A3 F20</u>	M3 F20
(11)	(12)	(13)	4x2 (14)	(15)	(16)	182	(18)	372	(20)	(21)
Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19
1x1	2x1	3x1	4x1	5x1	6x1	7x1	8x1	9x1	10x1	11x1
(0)	(1)	(2) Cp19	(3)	(4) Cp19	(5)	(6)	(7)	(8) Cp19	(9) Cp19	(10)
M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20
ento 9	1:									
REF_U:										
pad	7x3	(28)	Msc_	1 Chip	_11 с	hl_1	амр	= 1440	dt	- 146.
										DEE
HVD U-	in <10	.anvas:	CONST	ructor>	e: Dele	ting ca	anvas w	nth sa	me name	e: REF_
iiyo_0.				Chie	10 0	L1 7		- 490	d#	97 50
nyo_o.	100 -	1445	Mco	A REAL PROPERTY AND IN COLUMN	-10 C	nt_/	amp	= 460	ac=	07.50
pad	1x5	(44)	Msc_	Chie	10	6 C				
pad pad	1x5 9x3	(44) (30)	Msc_: Msc_:	3 Chip	19 c	hl_5 ch1 7—	amp	= 13/6	dt:	= -121. - 71_9
pad pad pad pad	1x5 9x3 11x3 7x3	(44) (30) (32) (28)	Msc_3 Msc_3 Msc_ Msc_3	3 Chip 3 Chi 3 Chi 3 Chie)_19 с .р_19)_19 <u>с</u>	hl_5 chl_7 hl 3	amp am amp	= 1376 p= 800 = 1504	dt: dt: dt:	= -121. = -71.8 = -146_
pad pad pad pad pad	1x5 9x3 11x3 7x3	(44) (30) (32) (28)	Msc_3 Msc_3 Msc_3 Msc_3	3 Chip _3 Chi 3 Chip 3 Chip	р_19 с .р_19 р_19 с	hl_5 chl_7 hl_3 	amp am amp	= 1376 p= 800 = 1504	dt: dt: dt:	= -121. = -71.8 = -146.
pad pad pad pad pad REF_D:	1x5 9x3 11x3 7x3	(44) (30) (32) (28)	Msc_: Msc_: Msc_ Msc_:	3 Chip _3 Chi 3 Chip	0_19 с .р_19 0_19 с	hl_5 chl_7 hl_3	амр ам амр	= 1376 p= 800 = 1504	dt: dt: dt:	= -121. = -71.8 = -146.

Eventi in ritardo di 50ns - Mappa HYBRID

HYB 500/510 gain 20'000 DAQ 20241124 183044

	× –					Нув_С	1					
	<u>F</u> ile <u>E</u> dit	<u>V</u> iew O	ptions <u>T</u> o	ols							H	<u>1</u> ¢
	1x11 (110)	2x11 (111)	3x11 (112)	4x11 (113)	5x11 (114)	6x11 (115)	7x11 (116)	8x11 (117)	9x11 (118)	10x11 (119)	11x11 (120)	Ĩ
	Cp16 M3 E20	Cp16	Cp16 M3 E20	Cp16 M3 E20	Cp16 M3 E20	Cp16 M3 E20	Cp16 M3 E20	Cp16	Cp16 M3 E20	Cp16 M3 E20	Cp16 M3 E20	VEDDE, biwoll
	1x10	2x10	3x10	4x10	5x10	6x10	7x10	8x10	9x10	10x10	11x10	VERDE: DIWEII
	(99) Cp16	(100) Cp16	(101) Cp16	(102) Cp16	(103) Cp16	(104) Cp16	(105) Cp16	(106) Cp16	(107) Cp16	(108) Cp16	(109) Cp16	ROSSO: good
	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	
	(88)	(89)	(90)	(91)	(92)	(93)	(94)	(95)	(96)	(97)	(98)	BLU: delay
	Cp16 M3 F20	Cp16 M3 F20	Cp16 M3 F20	Cp16 M3 F20	Cp16 M3 F20	Cp16 M3 F20	Cp17 M3 F20	PIANCO , donnio				
	1x8 (77)	2x8 (78)	3x8 (79)	4x8 (80)	5x8 (81)	6x8 (82)	7x8 (83)	8x8 (84)	9x8 (85)	10x8 (86)	11x8 (87)	DIANCO: uoppio
	Cp17	Cp17	Cp17	Cp17	Cp17	Cp17	Cp17	Cp17	Cp17	Cp17	Cp17	
	M3 F20 1x7	M3 F20 2x7	M3 F20 3x7	M3 F20 4x7	M3 F20 5x7	M3 F20 6x7	M3 F20 7x7	M3 F20 8x7	M3 F20 9x7	M3 F20 10x7	M3 F20 11x7	<mark>-</mark>
	(66)	(67)	(68)	(69)	(70)	(71)	(72)	(73)	(74)	(75)	(76)	
	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	
	1x6 (55)	2x6 (56)	3x6 (57)	4x6 (58)	5x6 (59)	6x6 (60)	7x6 (61)	8x6 (62)	9x6 (63)	10x6 (64)	11x6 (65)	
	Cp17	(00)	Cp17	Cp1	007	(00)	Cp18	Cp18	Cp18	Cp18	Cp18	
	.нз F20 1x5	M3 F20 2x5	M3 . 10 3x5	4x5	M3 F2 5x5	M3 F20 6x5	-3 F20 7x5	M3 F20 8x5	9x5	M3 F20 10x5	M3 F20 11x5	<mark>-</mark>
((44)	(45)	(46)	(47)	(48)	(49)	(50)	(51)	(52)	(53)	(54)	
	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	/3 F20	M3 F20	M3 F20	M3 F20	
	·~4 (22)	2x4	(25)	126	5	6x4	714	8x4	9x4	10x4	11x4	
	(33) Cp18	Cp18	(35) Cp18	(36) Cp18	(37) Cp18	(36) Cp18	(39) Cp18	(40) Cp18	(41) Cp18	(42) Cp18	(43) Cp18	
	M3 F20 1x3	M3 F20 2x3	M3 F20 3x3	M3 F20 4x3	M3 F20 5×3	M3 F20 6x3	M3 F20 7x3	M3 F20 8×3	M3 F20 9x3	M3 F20 10x3	M3 F20 11x3	<mark>_</mark>
	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	
	Cp18 M3 F20	Cp18 M3 F20	Cp18 M3 F20	Cp18 M3 F20	Cp19 M3 F20							
	1x2	2x2	3x2	4x2	5x2	6x2	7x2	8x2	9x2	10x2	11x2	
	(11) Cp19	(12) Cp19	(13) Cp19	(14) Cp19	(15) Cp19	(16) Cp19	(17) Cp19	(18) Cp19	(19) Cp19	(20) Cp19	(21) Cp19	
vento 10 1:	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	<mark>_</mark>
	(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
REF U:	Cp19 M3 F20	Cp19 M3 F20	Cp19 M3 F20	Cp19 M3 F20	Cp19 M3 F20	Cp19 M3 F20	Cp19 M3 F20	Cp19 M3 F20	Cp19 M3 F20	Cp19 M3 F20	Cp19 M3 F20	
												-
pad 5x6	(59)	Msc 1	Chip	10 c	hl 0	am	D= 115	2 d	t= -14	3.75		
larning in <tc< td=""><td>anvas::</td><td>Constr</td><td>uctor></td><td>- Dele</td><td>ting c</td><td>anvas</td><td>with s</td><td>ame na</td><td>me: RE</td><td></td><td></td><td></td></tc<>	anvas::	Constr	uctor>	- Dele	ting c	anvas	with s	ame na	me: RE			
rror in <tcan< td=""><td>vas::Re</td><td>sizePa</td><td>d>: Ca</td><td>nnot r</td><td>esize</td><td>pad. N</td><td>o curr</td><td>ent pa</td><td>d avai</td><td>lable.</td><td></td><td></td></tcan<>	vas::Re	sizePa	d>: Ca	nnot r	esize	pad. N	o curr	ent pa	d avai	lable.		
Hvb U:												
Let in the or												
pad 6x5	(49)	Msc 3	Chip	18 c	hl 10	а	mp= 14	72	dt= -1	31.25		
pad 9x5	(52)	Msc 3	Chip	18 c	hl 15	а	mo= 11	52	dt= -9	3.75		
pad 2x5	(45)	Msc 3	Chic	_18 c	hl_6	ar	n= 156	8 d	t= -13	7.50		
pad 1x5	(44)	Msc 3	Chic	18c	h1_7	ar	p= 147	2 d	t= -11	8.75		
pad 3x5	(46)	Msc 3	Chir	18 c	h1 9	ar	p = 163	2 d	t= -13	1 25		
pad 7x5	(50)	MSC 3	Chir	18 0	b1 13	-	$m_{D} = 14$	08	dt = -9	6 88		
pad_5x5	(48)	Msc 3	Chin	18 0	61 11	-	mp= 16	00	dt = -1	40 62		
pad 4x5	(40)	Msc 3	- Chin	18 6	ь <u>1 8</u>	arr	mp= 163	2 d	t15	0.00		
put and	(41)	lise_s	circp	-10 -	inc_o		p- 105	5 ×		0.00		
DEF D-											11.11	ACh w.RWFII test heam
KLI_U.											UN 7 16 1	NOD A-HMFFF (ASI NAAM
and Full	(50)	194 A	Char	44.1	61 0		154	ò	+ 15	0.50		

VERDE: biwell ROSSO: good **BLU**: delay **BIANCO**: doppio del

	× –					Hyb_U	I				
	<u>F</u> ile <u>E</u> dit	<u>V</u> iew <u>O</u>	ptions <u>T</u> o	ols							He
	1x11	2x11	3x11	4x11	5x11	6x11	7x11	8x11	9x11	10x11	11x11 (120)
	Cp16	Cp16	Cp16	Cp16	Cp16	Cp16	Cp16	Cp16	Cp16	Cp16	Cp16
	M3 F20	M3 F20	M3 F20 3x10	M3 F20	M3 F20	M3 F20	M3 F20 7x10	M3 F20 8×10	M3 F20 9x10	M3 F20 10x10	M3 F20
	(99)	(100)	(101)	(102)	(103)	(104)	(105)	(106)	(107)	(108)	(109)
	Cp16 M3 F20	Cp16 M3 F20	Cp16 M3 F20	Cp16 M3 F20	Cp16 M3 F20	Cp16 M3 F20	Cp16 M3 F20	Cp16 M3 F20	Cp16 M3 F20	Cp16 M3 F20	Cp16 M3 F20
	1x9	2x9	3x9	4x9	5x9	6x9	7x9	8x9	9x9	10x9	11x9
_	(88) Cp16	(89) Cp16	(90) Cp16	(91) Cp16	(92) Cp16	(93) Cp16	(94) Cp17	(95) Cp17	(96) Cp17	(97) Cp17	(98) Cp17
elav	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20
	(77)	(78)	(79)	(80)	(81)	(82)	(83)	(84)	(85)	(86)	(87)
	Cp17 M3 E20	Cp17 M3 E20	Cp17 M3 E20	Cp17 M3 E20	Cp17 M3 E20	Cp17 M3 E20	Cp17 M3 E20	Cp17 M3 E20	Cp17 M3 E20	Cp17 M3 E20	Cp17 M3 E20
	1x7	2x7	3x7	4x7	5x7	6x7	7x7	8x7	9x7	10x7	11x7
	(66) Cp17	(67) Cp17	(68) Cp17	(69) Cn17	(70) Cp17	(71) Cn17	(72) Cp17	(73) Cn17	(74) Cp17	(75) Cn17	(76) Cp17
	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20
	1x6 (55)	2x6 (56)	3x6 (57)	4x6 (58)	5x6 (59)	6x6 (60)	7x6 (61)	8x6 (62)	9x6 (63)	10x6 (64)	11x6 (65)
	Cn17	Cp17	Cn17	Cp17		Cp18		Cp18	Ср18	Cp18	Cn18
	1x5	M3 F20 2x5	M3 F20	M3 F20 4x5	M3 F20 5x5	M3 F20 6x5	M3 F20 7x5	M3 F20 8x5	M3 F20 9x5	M3 F20 10x5	11x5
	(44)	(45)	(46)	(47)	(48)	(49)	(50)	(51)	(52)	(53)	(54)
	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	J3 F20	M3 F20	M3 F20	Cp18	M3 F20	Cp18 M3 F20
	114	2x4	3x4	4x4	5x4	6x4	7x4	8x4	9x4	10x4	1194
	(33) Cp18	(34) Cp18	(35) Cp18	(36) Cp18	Cp18	(38) Cp18	(39) Cp18	(40) Cp18	(41) Cp18	(42) Cp18	(43) Cp18
	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F2L	M3 F20	M3 F20	M3 F20
	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	98.3	(31)	(32)
	Cp18 M3 E20	Cp18 M3 E20	Cp18 M3 E20	Cp18 M3 E20	Cp19 M3 E20	Cp19 M3 E20					
	1x2	2x2	3x2	4x2	5x2	6x2	7x2	8x2	9x2	10x2	11x2
	(11) Cp19	(12) Cp19	(13) Cp19	(14) Cp19	(15) Cp19	(16) Cp19	(17) Cp19	(18) Cp19	(19) Cp19	(20) Cp19	(21) Cp19
	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20
	1x1 (0)	2x1 (1)	3x1 (2)	4x1 (3)	5x1 (4)	6x1 (5)	7x1 (6)	8x1 (7)	9x1 (8)	10x1 (9)	11x1 (10)
to 13_1:	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19
	M3 F20	WI3 F20	W3 F20	M3 F20	W3 F20	W3 F20	M3 P20	M3 F20	M3 P20	W3 F20	M3 F20
F_U:											
pad 5x5	(48)	Ms	c_1 C	hip_10	chl_	13	amp=	1504	dt=	-159.	38
vb_U:											124
pad 1x5	(44)	Ms	c 3 C	hip 18	chl	7	amp=	1024	dt=	-96.88	
pad 3x5	(46)	Ms	c 3 C	hip 18	chl	9	amp=	1504	dt=	-121.8	8
pad 7x5	(50)	Ms	-3 C	hip 18	ch1	13	amp=	1600	dt=	-140	62
pad 9x5	(52)	Msi	-3 C	hip 18	ch1	15	amp=	1376	dt=	-118	75
pad 11x5	(54)	M	sc 3	Chip 1	8 chl	17	amp	= 960	dt=	-71_8	8
pad 7x4	(39)	Ms	C3 C	hin 18	chl	22	amp-	1568	dt-	-146	88
pad 9x4	(41)	Me	-3 C	hip 18	chl	24	amp-	1120	dt-	-84 3	8
pad 5x5	(48)	Me		hip 19	ch1	11	amp-	1568	dt-	-142	75
pag 2x2	(40)		<u> </u>	heb_to	ene_		-dub-	1500	00-	145.	
E D.											

Event<u>i in ritardo di 50ns - M</u>appa HYBRID

	· -					нур_с	,				r i
	<u>F</u> ile <u>E</u> dit	<u>V</u> iew O	ptions <u>T</u> o	ols							<u>H</u> e
	1x11	2x11	3x11	4x11	5x11	6x11	7x11	8x11	9x11	10x11	11x11
	Cp16	Cp16	(112) Cp16	Cp16	Cp16	(115) Cp16	(116) Cp16	Cp16	Cp16	Cp16	Cp16
	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20
	1x10 (99)	2x10 (100)	3x10 (101)	4x10 (102)	5x10 (103)	6x10 (104)	7x10 (105)	8x10 (106)	9x10 (107)	10x10 (108)	11x10 (109)
	Cp16	Cp16	Cp16	Cp16	Cp16	Cp16	Cp16	Cp16	Cp16	Cp16	Cp16
	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20
	(88)	(89)	(90)	(91)	(92)	(93)	(94)	(95)	(96)	(97)	(98)
	Cp16	Cp16	Cp16	Cp16	Cp16	16		Cp17	Cp17	Cp17	Cp17
	1x8	2x8	3x8	4x8	5x8	6x8	7x8	8x8	9x8	10x8	11x8
	(77)	(78)	(79)	(80)	(81	(82)	(83)	(84)	(85)	(86)	(87)
	M3 E20	M3 E20	M3 E20	M3 E20	M3 E20	ACC IN	Cp17	M3 E20	M3 E20	M3 E20	M3 F20
	1x7	2x7	3x7	4x7	5x7			8x7	9x7	10x7	11x7
	(66) Cp17	(67) Cp17	(68) Cn17	(69) Cn17	(70) Cp17	(71) Cn17	(72) Cp17	(73) Cn17	(74) Cp17	(75) Cn17	(76) Cp17
	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20
	1x6	2x6	3x6	4x6	5x6	5×6	7yF	8x6	9x6	10x6	11x6
	Cp17	Cp17	Cp17	Cp17	Cp17	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18
	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20
	(44)	(45)	3x5 (46)	4x5 (47)	5X5 (48)	6X5 (49)	(50)	8x5 (51)	9x5 (52)	(53)	(54)
	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18
	M3 F20	M3 F20	M3 F20 3x4	M3 F20	M3 F20	M3 F20 6x4	M3 F20	M3 F20 8x4	M3 F20 9x4	M3 F20 10y4	M3 F20
	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)
	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18	Cp18
	1x3	2x3	3x3	4x3	5x3	6x3	7x3	8x3	9x3	10x3	11x3
	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20
	1x2	2x2	3x2	4x2	5x2	6x2	7x2	8x2	9x2	10x2	11x2
100to 24 1	(11) Cp19	(12) Cp19	(13) Cp19	(14) Cp19	(15) Cp19	(16) Cp19	(17) Cp19	(18) Cp19	(19) Cp19	(20) Cp19	(21) Cp19
/enco 24_1:	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20
	1x1 (0)	2x1	3x1	4x1	5x1	6x1	7x1	8x1	9x1	10x1	11x1 (10)
REF U:	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19	Cp19
	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20	M3 F20
nad 7x8	(83)	M	sc 1	Chin	9 chl	8	amo	- 137	6 6	ft= -1	65 62
and Su0				Chan	0 - b1	-44	Grip	- 12	4.4	4+	165 60
han ovo	(02)	- in	sc_1	circp_	e circ	-11	di	b= 12	11	ut= -	105.02
arning in <	TCanva	s : : Coi	nstruc	:tor>:	Delet	ing c	anvas	with	same r	name:	REF_U
Hvb U:											i .
pad 6x7	(71)	M	c 2	Chin	17 ch	1 20		mp- 7	04	dt	1/12 75
	(71)		2-2	chiep_	17 1	1 22	d	mp- /	CO	11- T	150.00
pad /x/	(72)	M:	SC_3	Chip_	17 ch	123	a	mp= 9	00	0T= -	159.38
pad 9x8	(85)	. M:	sc_3	Chip_	17 ch	1_12	a	mp= 8	64	dt= -	93.75
pad 7x8	(83)	M	sc 3	Chip :	17 ch	l 10	a	mp = 1	408	dt=	-143.75
pad 6x8	(82)	M	5C 3	Chin	17 ch	1 11		$m_{D}=1$	312	dt=	-193 75
pag one	(94)		- 11 - 11 - 11 - 11 - 11 - 11 - 11 - 1	en er		and the second		and the second	an a	A CONTRACTOR OF THE OWNER OWNE	
0.55.0											
REF_D:											
and 6v0	7021	M	1 1	Chio	12 ch	1 11	14	mo 1	504	d+	150 00

VERDE: biwell ROSSO: good BLU: delay BIANCO: doppio delay

