

## RF Installations in the SPS<sup>1</sup>

### BA 1

Name	s [m]	Description and cable numbers
BPSH.12174	693.03	beam position, Schottky, horizontal only Coil 1 is used, it is connected directly to up going cable 63723; cable 1 (BOBIN) is hanging free
BPSV.12179	696.55	beam position, Schottky, vertical, 10 $\mu$ S/h only Coil 1 is used, it is connected directly to up going cable 63724 via rack

### BA 2

Name	s [m]	Description and cable numbers
BPCR.20802	1406.31	beam position, directional coupler, transverse damper
BPCR.21434	1606.19	beam position, directional coupler, transverse damper
BPCR.21435	1607.06	beam position, directional coupler, transverse damper
ZKHA.21991	1784.00	electrostatic kicker, horizontal, enlarged, Schottky kicker connected to pwr ampl in BA2, input to amplifier: PCR; used for continuous Q measurement 1: 63753 upstream (inside), 2: 63754 upstream (outside), 3: 63755 downstream (inside), 4: 63756 upstream (outside). Cable assignment does not correspond to drawings nor to labels in RA at surface.
ZKV.21993	1785.52	electrostatic kicker vertical, Schottky kicker connected to power amplifier in BA2; used for continuous Q measurement 1: 63751 downstream (up), 2: 63752 downstream (down), 3: 63749 upstream (up), 4: 63750 upstream (down). Cable assignment does not correspond to drawings nor to labels in RA at surface.

<sup>1</sup>for pictures see: [http://ab-div-op-sps.web.cern.ch/ab-div-op-sps/SPS\\_Photos/SPSMachineElements\\_Frame.htm](http://ab-div-op-sps.web.cern.ch/ab-div-op-sps/SPS_Photos/SPSMachineElements_Frame.htm)  
or figind.txt

## BA 3

Name	s [m]	Description and cable numbers
AEWA.30903	2590.44	RF pick-up electrode, wide band, coaxial line, type A, to CCR, (ex use: for pLHC synchronisation loop and ex phase pu, 100 MHz ppbar, lepton 200 MHz); ANZAC 8-WAY POWER DIVIDER DS-8 (2-2000 MHz)
		1: 31003 - RFP4038 - 3302633 - RFP5242 - 31073 - CCR 2: 31004 free
BPCR.31202	2686.21	beam position, directional coupler, radial pu for fixed target operation
		6 dB att on all H9 inputs, H-electrodes used to make $\Delta$ , V-electrodes used to make $\Sigma$
		$D_x = 4.28$ m (standard optics), $D_x = 4.49$ m (LHC beam optics)
		1: 31007 $\Sigma$ , H9 hybrid 2: 31008 $\Delta$ , H9 hybrid
AERB.31302	2718.17	pickup electrode, radial, vert pu turned by 90deg, usage: 1) 80 MHz filters in chain for single bunch, 2) ampli and mixer for ion operation without filter.
		$D_x = 2.53$ m (standard optics), $D_x = 2.32$ m (LHC beam optics)
		1: 31010 2: 31009



Name	s [m]	Description and cable numbers
AEPC.31632	2820.06	phase pu for high intensity use, upstream cavity 1, used with amplifier for ions, DMS-115 TRM 500 W (4 to 1) hybrid, cable role $\tau$ : 17 ns + ? 1: 31011
AEPA.31633	2820.78	RF pick-up electrode, phase detection, type A, resonant 200 MHz, p2, 50 W power divider (4 to 1) Techn. Research and Manufacturing Model DH113 200 MHz $\pm$ 5 MHz, cable role $\tau$ : nobody knows (ask PB) 1: 31198
ACTA.31637	2832.32	TWC 200 MHz, cavity 1, short cavity (42 cells, 16.000 m), coax switch, cable 1 fxd target, field probes to add voltage of each cell, works only for p. For pbar only the voltage of central cell is used, it is selected by a switch (its control cable is disconnected now), cable 2 ppbar; hybrids: Anzac DS-309 2-500 MHz 1: 30019; 2: 30018 E4: $\Sigma$ ; E5: CentreProbe (23 Test)
ACL.31695	2843.80	TWC 800 MHz, forward wave structure HOM couplers: Sect. 1: none; Sect. 2: cell 2,3: inside & outside; Sect. 3: cell 2,3: up, cell 3,4,8,9: inside & outside 1: 30470 centre probe (delay: 5.9 ns + 97.3 ns (?)) 2: 30468 sump, downstream window input window coupler n/c
AEWA.31703	2846.26	longitudinal wide band pu, coaxial line, type A; feedforward, long. damper, beam signal limiter (synchro); power divider: 2-2000 MHz, ANZAC DS-8 1: 31160 (to CCR, unused) 2: 31200
AEG.31705	2846.79	tuned high frequency pu, 0.6 to 1.6 GHz 1: 31161 2: 31165 (tuning control)
AETA.31720	2852.39	ferrite loaded waveguide mode trap, below 750 MHz inductive, above resistive
AEW.31731	2851.63	wideband pu; sampling and mountain range; 8-way power divider ANZAC DS-8 (2-2000 MHz) in tunnel: via B6 RPP31706 to sampling and via C3 RPP31706 to 1 5/8" main cable 1: 31123
AET.31731	2852.00	ferrite loaded waveguide mode trap, below 750 MHz inductive, above resistive

Name	s [m]	Description and cable numbers
APWL.31732	2852.39	longitudinal wideband pu; beam signal observation RA3343; first time installed for start-up 2006 1: 31122(3/8") - 31019(7/8")
ACL.31733	2854.87	TWC 800 MHz, forward wave structure HOM couplers: Sect. 1: none; Sect. 2: cell 4,5: up, cell 9,10: inside & outside; Sect. 3: cell 3,4: up 1: 30471 centre probe, delay: 5.6 ns + 93.3 ns 2: 30469 sump, downstream window input window coupler n/c
ACTB.31739	2866.35	TWC 200 MHz, cavity 2, short cavity (42 cells, 16.000 m), cable 1 fxd target, cable 2 test, field probes to add voltage of each cell, works only for p. For pbar only the voltage of central cell is used, it is selected by a switch (its control cable is disconnected now) 1: 30031 2: 30032
BPW.31798	2876.83	wideband transv. PU (large diameter), to PCR:CCR:BC0RA7411 (was used for cooling LO), now horiz. proton PU, (3*H-183) 1: 31025 (delta) 2: 31026 (sum)
AEP.31799	2877.76	phase pu for hi intensity operation, downstream cavity 2, DMS-115 TRM 500 W (4 to 1) hybrid 1: 31022, cable role delay: 141.3 ns
ACTC.31836	2897.95	TWC 200 MHz, cavity 3, long cavity (54 cells, 20.196 m), coax switch, cable 1 fxd target/ppbar, cable 2 ppbar field probes to add voltage of each cell, works only for p. For pbar only the voltage of central cell is used, it is selected by a switch (its control cable is disconnected now) 1: 30030 2: 30055
BPWA.31901	2910.07	vertical PU (small diameter), 2 res. adders replaced by H9 hybrid and H-183 hybrid replaced by H9 (2001/2002) 1: 31194 $\Sigma$ , CGN50 2: 31195 $\Delta$ , CGN50



## BA 3

Name	s [m]	Description and cable numbers
AESA.31931	2915.36	wideband PU, BW 5 kHz to 1 GHz, BW with AVANTEK AV9 amplifier limited to 400 MHz, $Z_T = 1.1 \Omega$
		power: 31191 – A1 RPP31707: A2/A3 – RPP31706: 31117/31118
		RF: 31192/31193 – D1/D5 RPP31707:B3/B4 – RPP 31706:31016/31017
		1: 31191 (p.s. for E810F pentode amplifier) 2: 31192 (RF), (A), CG50 3: 31193 (RF), (B), CG50
BPWA.31931	2915.89	wideband transv. PU (small diameter) for PCR, vert p pu (3*H-183)
		1: 31024 2: 31023
AEWB.31932	2916.61	wideband pu, put into position in shutdown 2002/2003 (coming from position 31732)
		1: 3301341A to RFP4038 (7/8" 210 m)
ACTD.31934	2928.62	TWC 200 MHz, cavity 4, long cavity (54 cells, 20.196 m), coax switch, cable 1 fxd target/ppbar, cable 2 ppbar, field probes to add voltage of each cell, works only for p. For pbar only the voltage of central cell is used, it is selected by a switch (its control cable is disconnected now)
		1: 30054
		2: 30053
BPWB.32101	2974.07	wideband transv. PU (small diameter), H plane, instability analysis using 31197 from 31/08/90 on (3×H-183), 2×H-183 spare, cable role
		31196: $\Delta$
		31197: $\Sigma$
AEPA.33404	3390.60	phase pu for p-pbar, resonant 200 MHz, position optimised for 3 p on 3 pbar bunches
		1: 31199

## A Storage or Laboratory

Name	s [m]	Description and cable numbers
ex-ZKHV.12197	700.22	electrostatic kicker, horizontal + vertical (super damper), connected for proton excitation
		V top: 50 $\Omega$ (upst.), 63746/RA1531 (downst.)
		V bottom: 50 $\Omega$ (upst.), 63748/RA1531 (downst.)
		H outside: 50 $\Omega$ (upst.), 63733/RA1531 (downst.)
		H inside: 50 $\Omega$ (upst.), 63735/RA1531 (downst.)
		loads: downstream; 62 732: free
		1: 63746, 2: 63733 3: 63748, 4: 63735
		chassis with 50 $\Omega$ loads standing sideways on floor, no label attached
ex-ZKHV.12197	700.22	removed shutdown 2001/2002
		electrostatic kicker, horizontal + vertical (super damper), connected for proton excitation
		V top: 50 $\Omega$ (upst.), 63746/RA1531 (downst.)
		V bottom: 50 $\Omega$ (upst.), 63748/RA1531 (downst.)
		H outside: 50 $\Omega$ (upst.), 63733/RA1531 (downst.)
		H inside: 50 $\Omega$ (upst.), 63735/RA1531 (downst.)
		loads: downstream; 62 732: free
		1: 63746, 2: 63733 3: 63748, 4: 63735
ex-ZKH.12198	701.27	chassis with 50 $\Omega$ loads standing sideways on floor, no label attached
		removed shutdown 2001/2002
		electrostatic kicker, horizontal, long Schottky kicker, used for crystal extraction (1996)
		wall: (upst.) 63734/RA1530, local 50 $\Omega$ load
		wall: (downst.) 31231/RA1537, power in
		inside: (upst.) 63732/RA1530, local 50 $\Omega$ load
		inside: (downst.) 31232/RA1537, power in
		1: 63734 : outside, upstream 2: 63732 : inside, upstream 3: 31231 : outside, downstream 4: 31232 : inside, downstream
ex-ZKH.12198	701.27	removed shutdown 2001/2002

Name	s [m]	Description and cable numbers
ex-AESA.30902	2590.08	RF pick-up electrode, electrostatic, type A, PU belongs to RF, used by SL/BI; storage INB: S100107, contact: JFM 31004
ex-AEW.41906	4063.16	wide-band pu, monitoring of beam, current measurement for SCC phasing, trigger for voltage measurement (type GL); not all ports are used; removed from SPS during shutdown 2000/2001, storage INB: S100425, contact: JFM 33573
ex-AEHV.42175	4149.56	vertical 460 MHz Schottky pu, upstream side of electrodes combined with MINICIRCUITS ZFSC-2-4, (check position); removed from SPS during shutdown 2000/2001, storage INB: S100108, contact: JFM 31 257; 31 255 free



## B Pick-up description

Pick-Up	Description
BPW	wideband transv. PU (large diameter: 161 mm outer diameter), BW 163 MHz to 3.3 GHz, $Z_T = 3.9 \Omega$
BPWA	wideband transv. PU (small diameter: 140 mm outer diameter), V plane, BW 133 MHz to 4 GHz, $Z_T = 5.7 \Omega$
BPWB	wideband transv. PU (small diameter: 140 mm outer diameter), H plane, BW 133 MHz to 4 GHz, $Z_T = 5.7 \Omega$

## C Further reading

T. Linnecar, *The high frequency longitudinal and transverse pick-ups used in the SPS*, CERN SPS ARF 78-17, August 1978.