The CTFRun No. 2 1994

Results and Comments

H. Braun, JHB. Madsen and S. Schreiber

Participants : H. Braun, R. Bossart, J.P. Delahaye, J. Durand, S. Hutchins J.C. Godot, I. Kamber, J.H.B. Madsen, J. Mourier, G. Rossat, L. Rinolfi, S. Schreiber, J. Sladen, G. Suberlucq, J.C. Thomi, I. Wilson, W. Wuensch, M. Comunian, B. Pincott, E. Chevally

1. General

Start : 5/07/94 End : 25/08/94

Modifications in respect to Run 1 (see: PS/LP/Note 94-30 (Tech))

Beamline : - the collimator of the BPM beam line removed

- for calibrating the UMA's with a Faraday Cup (FC) the quadrupole triplet behind LAS was removed from 15 to 19/08 then,
- QDN415 replaced for type QL2 water cooled and QFN620 for a QL1

RF-network : KLY97 feeding LAS KLY98 feeding gun and booster - see fig. 1

Laser: relay imaging and spatial filtering as installed improved spot size

Pulse train generator : a pulse doubler in front of the existing two generators permits to create a train of 48 pulses or two closely spaced pulses

UMA signal attenuated by a factor 10; announced ranges :

high gain: 1nC to 20nC

low gain: 20nC to 200nC

2. Objectives of the run

- Test if with the higher accelerating gradient in LAS a better beam for 30 GHz power by TRS is obtained
- Calibrate the UMA's with the FC
- Bunch length measurements
- Transverse beam emittance measurements
- Experiments with two laser pulses in one rf bucket
- Beam for testing the BPM's and a Beam Position and Intensity Monitor a prototype made at the Uppsala University.

3. Beam momenta

To get with the new rf power distribution the same field levels in the gun and booster as at run 1 we took as reference the signal BL1 = 2.5 V (Booster Loop 1) and this for MDK98 PFN at 32.7 kV.

Using the spectrometer and the calibration for BHZ385 of 0.518 MeV/c A,momentum gun:4.0 MeV/cFig. 2Logbook p. 165momentum gun + booster : 11.0 MeV/cp. 98

With the KLY97 set at a power level of around PKI97 = 30 MW, this for MDK97 PFN at 36.0 kV, for BHZ430 the calibration of 2.698MeV/c A, momentum behind LAS : 82.0 MeV/c for low charge.

Gradient:	17.3 MV/m
During run 1 we had:	59.6 MeV/c

During run 2 we had twice the power into LAS and thus expect: 81 MeV/c.

4. More 30 GHz power generated by TRS

At first the 24 bunch train had been adjusted for intra bunch spacing and position on the photocathode.

Several optics were tried. Finally we run best with the large solenoid on LAS off and with SNF350/380 at 47/50 A and QDN410/QFN415/QDN420 at -5.75/ 48.1/ - 8.2 A (QFN415 type QL2).

Our main goal of the CTF was attained: p. 153

- 30 GHz power from TRS 60 MW (peak) with

	- Peak electric field	110 MV/m
	- Average electric field	79 MV/m
and in CAS	- Peak electric field	103 MV/m
	- Average electric field	73 MV/m

We do not have a simultaneous reading of the 30 GHz and the UMA's.

A representative set of UMA-readings is :

- UMA375 67.5 nC or 2.8 nC per bunch
- UMA385 69.3 nC or 2.9 nC pb
- UMA406 68.0 nC or 2.8 nC pb
- UMA455 53.4 nC or 2.2 nC pb

For a charge of 68 nC the 60 MW is generated if the bunch length is 12 ps FWHH and thus close to our measurement (see ch. 6).

5. Comparison UMA - FC

During the previous run we had found that the digital readout of the UMA saturates and therefore an attenuator was put in.

At low charges the UMA agreed well with the FC put in the spectrometer line of BHZ350 and of BHZ430.For high charges, due to the momentum spread, the beam becomes to wide to enter fully the cup. As it is essential to know the charge in the bunch train up to 100 nC at least, we removed the triplet behind LAS to have the FC on the straight beam line. From fig.3,4 and 5 we see that the UMA digital readout agrees with the FC reading.

For single bunches the agreement is less good for charges above 4 nC. We believe that this is caused by bunch blow-up as the FC is reading less with increasing charge (Fig. 6).

6. Bunch length measurements with TCM's and streakcamera

The laser pulse width measured with the streakcamera is 8.0 ps FWHH at 262 nm.

So far, the bunch length was found to be 10 ps or more. By filtering the light coming from the TCM's such that the red spectrum goes to the camera only, the bunch length becomes shorter.

Results: fig. 6, 7 and 8. These results now agree better with the simulations. But, what in the optics of the TCM's is causing this pulse lengthening?

Note that the dip in the curve on fig. 8 was found earlier already.

7. Transverse bunch emittance

The programme conceived by M. Comunian is still under development but a first result was obtained: the norm.rms.emittance in x for a 2.8 nC bunch is 39 mm.mrad.

The transverse bunch profile is measured with TCM445T and the current in QDN420 varied. One emittance measurement takes about 10 minutes.

8. Two bunches in one rf bucket

With a splitter and an optical delay two laser pulses are made with a spacing which can be adjusted from a few ps to 333 ps. This permits to make a long bunch and to study the beam dynamics in the gun. The bunch spacing varies with the rf phase at the laser pulse arrival. See fig. 10 and 11.

9. Testing beam position monitors

The CLIC - BPM test, results fig. 12, showed that the beam position had in the vertical plane a maximum jitter of \pm 17 10⁻⁶ m.

A prototype BPM made by the Uppsala University was installed behind the UMA406. The signal could not be used due to strong oscillations. These oscillations were attributed to wakefields created by the bunch.







P183

3



Charge by UMA406 and FC Train of 24 bunches



- - 32 20 121. - 20 - 28 -12 -16 - 24 4 ထု 0 % FC differs from UMA406 Charge in single bunch I For different optics 12 ◆ FC +% FC differs UMA406 in nC 9 18/19/08'94,p184-188 + FC in nC S 10 42 0 0 ဖ 2 4 ω 4



Bunch length as function of phase Measured with TCM390C



On 9/08/'94, page 170 Phases are relative

8



Phases are relative

Laser on Streak Camera

10

TCM 390C





Comparison Measurement/CTFSIM



LINE : FROM CTESIM. DOTS : MEASURED, see fig10

(1)





Page 1

Distribution:

Bossart R. PS Braun H. PS Brouet M. AT Chautard F. PS Chevallay E. PS Comunian M. PS Consint Roberto PS Delaftaye JP. PS Fischer Claude Garoby, R. PS Ceissler K.K. AT Codot JCl. PS Ceissler K.K. AT Codot JCl. PS Guignard G. SL Hübner K. DG Hutchins S. PS Jensen E. PS Johnson C. D. PS Kamber I. PS Koziol, H. PS Kattsen J.H.B. PS Metral G. PS Millich A. SL Pearce P. PS Riche A.J. PS Riche A.J. PS Kiege Hans AT Kinolfi L. PS Schneit W. Bat. 584 Schreiber S. AT Suberlucq G. PS Thomi J.C. PS Wilson I. SL Wuensch W. SL Durand J. PS Pincott B. PS	Autin B.	PS
Braun H.PSBrouet M.ATChautard F.PSChevallay E.PSConsint RobertoPSDelahaye JP.PSFischer ClaudeSLGaroby, R.PSCeissler K.K.ATCodot J. Cl.PSGuignard G.SLHübner K.DCHutchins S.PSJohnson C. D.PSKamber I.PSJohnson C. D.PSKamber I.PSNotrialichenko A.PSMatsen J.H.B.PSMetral G.PSPotier JP.PSRiche A.J.PSRiche A.J.PSRiche A.J.PSSchneit W.Bat. 584Schneit W.Bat. 584Schneit W.PSThorndaht I.PSWarner D.J.PSWilson I.SLWuensch W.SLDurand J.PSPincott B.PSHourier J.PSPincott B.PS	Bossart R:	PS
Brouet M. AT Chautard F. PS Chevallay E. PS Comunian M. PS Consint Roberto PS Defaitable JP. PS Fischer Chaude SL Garoby, R. PS Ceissler K.K. AT Cedot JCl. PS Cuignard G. SL Hübner K. DG Hutchins S. PS Jensen E. PS Johnson C. D. PS Kamber I. PS Koziol, H. PS Koziol, H. PS Metral G. PS Millich A. SL Pearce P. PS Riche A.J. PS Riche A.J. PS Riche A.J. PS Schnell W. Bat. 584 Schreiber S. AT Suberlucq G. PS Warner D.J. PS Wilson I. SL Wuensch W. SL Durand J. PS Pincott B. PS	Braun H.	PS
Chautard F. PS Chevallay E. PS Comunian M. PS Consist Roberto PS Delahaye JP. PS Fischer Chaude SL Garoby, R. PS Ceissler K.K. AT Cedot JCl. PS Guignard G. SL Hübner K. DG Hutchins S. PS Jensen E. PS Johnson C. D. PS Kamber I. PS Koziol, H. PS Kathen J.H.B. PS Metral G. PS Millich A. SL Pearce P. PS Riche A.J. PS Riche A.J. PS Riche A.J. PS Kiege Hans AT Suberlucq G. PS Thomi J.C. PS Wilson I. SL Wuensch W. SL Durand J. PS Pincott B. PS	Brouet M.	AT
Chevallay E. PS Comminan M. PS Corsint Roberto PS Delahaye JP. PS Eischer Chaude SL Garoby, R. PS Geissler K.K. AT Gedot JCl. PS Guignard G. SL Hübner K. DG Hutchins S. PS Jensen E. PS Johnson C. D. PS Kamber I. PS Koziol, H. PS Koziol, H. PS Koziol, H. PS Koziol, H. PS Mathen J.H.B. PS Metral G. PS Millich A. SL Pearce P. PS Riche A.J. PS Riche A.J. PS Riche A.J. PS Riche A.J. PS Kimolfi L. PS Schnell W. Bat. 584 Schreiber S. AT Suberlucq G. PS Wilson I. SL Wuensch W. SL Durand J. PS Pincott B. PS	Chautard F	PS
Comunian M. PS Corsint Roberto PS Delahaye JP. PS Eischer Chaude SL Garoby, R. PS Ceissler K.K. AT Codot JCl. PS Guignard G: SL Hübner K. DG Hutchins S. PS Jensen E. PS Johnson C. D. PS Kamber I. PS Koziol, H. PS Koziol, H. PS Mathen J.H.B. PS Metral G. PS Millich A. SL Pearce P. PS Polier JP. PS Riche A.J. PS Riche A.J. PS Riche A.J. PS Schnelt W. Bat. 584 Schreiber S. AT Suberlucq G. PS Thomi J.C. PS Warner D.J. PS Wilson I. SL Wuensch W. SL Durand J. PS Pincott B. PS	Chevallay E	PS
Corsini Roberto PS Defanaye JP. PS Eischer Claude SL Garoby, R. PS Ceissler K.K. AT Cedet JCl. PS Guignard G. SL Hübner K. DG Hutchins S. PS Jensen E. PS Johnson C. D. PS Kamber I. PS Koziol, H. PS Koziol, H. PS Koziol, H. PS Mathen J.H.B. PS Metral G. PS Millich A. SL Pearce P. PS Potier JP. PS Riche A.J. PS Riche A.J. PS Schnett W. Bat. 584 Schreiber S. AT Suberlucq G. PS Thomi J.C. PS Warner D.J. PS Warner D.J. PS Wilson I. SL Wuensch W. SL Durand J. PS Pincott B. PS	Comun ian M.	PS
Delahaye JP.PSFischer ClaudeSLGaroby, R.PSCeissler K.K.ATCodot JCl.PSGuignard G.SLHübner K.DCHutchins S.PSJensen E.PSJohnson C. D.PSKamber I.PSKoziol, H.PSKoziol, H.PSMattsen J.H.B.PSMetral G.PSMitchallichenko A.PSMitchallichenko A.PSRiche A.J.PSRiege HansATSuberlucq G.PSThorndahl L.PSWarner D.J.PSWarner D.J.PSWilson I.SLWuensch W.SLDurand J.PSMourier J.PSMourier J.PSMillich F.PSSchreiber S.ATSuberlucq G.PSThorndahl L.PSWarner D.J.PSWilson I.SLWuensch W.SLDurand J.PSMourier J.PSPincott B.PS	<u> </u>	PS
Eiseher ClaudeSLGaroby, R.PSGeissler K.K.ATGodot JCl.PSGuignard G.SLHübner K.DGHutchins S.PSJensen E.PSJohnson C. D.PSKamber I.PSKoziol, H.PSKerner H.PSLe Gras MPSMathsen J.H.B.PSMetral G.PSMitchallichenko A.PSMillich A.SLPearce P.PSRiche A.J.PSRiege HansATSchreiber S.ATSuberlucq G.PSThomi J.C.PSWilson I.SLWuensch W.SLDurand J.PSWilson I.SLWuensch W.SLJord J.PSMourier J.PSMillich J.PSSchreiber S.ATSuberlucq G.PSThomi J.C.PSWarner D.J.PSWarner D.J.PSWuensch W.SLDurand J.PSMourier J.PSPincott B.PS	Delahaye JP.	PS
Garoby, R. PS Ceissler K.K. AT Guignard G. SL Hübner K. DG Hutchins S. PS Jensen E. PS Johnson C. D. PS Kamber I. PS Koziol, H. PS Kitchallichenko A. PS Millich A. SL PS Riche A.J. PS Riege Hans AT Suberlucq G. PS Kinolfi L. PS Kaner D.J. PS Warner D.J. PS Wuensch W. SL Durand J. PS Kitchall, PS Kilson I. SL Wuensch W. SL Durand J. PS Kitchall, PS Kilson J. PS Kilson	Eiseher Claude	SL
Ceissler K.K.ATGuignard G:SLHübner K.DGHutchins S:PSJensen E.PSJohnson C. D.PSKoziol, H.PSKoziol, H.PSKoziol, H.PSKoziol, H.PSMattsen J.H.B.PSMetral G.PSMillich A.SLPearce P.PSRiche A.J.PSRiche A.J.PSRiche A.J.PSSchnelt W.Bat. 584Schreiber S.ATSuberlucq G.PSThorndaht L.PSWarner D.J.PSWuensch W.SLDurand J.PSHourier J.PSMourier J.PSManeorer M.M	Garoby, R.	PS
Codot JCl.PSGuignard G.SLHübner K.DGHutchins S.PSJensen E.PSJohnson C. D.PSKamber I.PSKoziol, H.PSKoziol, H.PSMatsen J.H.B.PSMetral G.PSMillich A.SLPearce P.PSRiege HansATRinolfi L.PSRiche A.JPSSchneit W.Bat. 584Schneit W.Bat. 584Schneit T.PSWarner D.J.PSWilson I.SLWuensch W.SLDurand J.PSMourier J.PSHorsderPS	<u> </u>	AT
Guignard G. SL Hübner K DG Hutchins S. PS Jensen E. PS Johnson C. D. PS Kamber I. PS Koziol, H. PS Koziol, PS Koziol, PS Koziol, PS Karner D.J. PS Walson I. SL Wuensch W. SL Durand J. PS Koziol, PS Koziol, PS	- Godot JCl.	PS
Hübner K DG Hutchins S. PS Jensen E. PS Johnson C. D. PS Kamber I. PS Koziol, H. PS Koziol, H. PS Matsen J.H.B. PS Metral G. PS Millich A. SL Pearce P. PS Potier JP. PS Riche A.J. PS Riege Hans AT Rinolfi L. PS Schnelt W. Bat 584 Schreiber S. AT Suberlucq G. PS Thomi J.C. PS Warner D.J. PS Warner D.J. PS Warner D.J. PS Warner J. PS Mourier J. PS Mourier J. PS	Guignard G:	SL
Hutchins S.PSJensen E.PSJohnson C. D.PSKamber I.PSKoziol, H.PSKoziol, H.PSKoziol, H.PSMatsen J.H.B.PSMetral G.PSMillich A.SLPearce P.PSRiche A.J.PSRiege HansATRinolfi L.PSSchnelt W.Bat 584Schnelt W.Bat 584Schnelt W.PSThomi J.C.PSWarner D.J.PSWilson I.SLWuensch W.SLDurand J.PSMourier J.PS <td> Hübner K</td> <td>DG</td>	Hübner K	DG
Jensen E. PS Johnson C. D. PS Kamber I. PS Koziol, H. PS Mathematical States Metral G. PS Metral G. PS Millich A. SL Pearce P. PS Potier JP. PS Riche A.J. PS Riche A.J. PS Riege Hans AT Rinolfi L. PS Rossat G. PS Schnell W. Bat. 584 Schreiber S. AT Suberlucq G. PS Thomi J.C. PS Warner D.J. PS Wilson I. SL Wuensch W. SL Durand J. PS Pincott B. PS	Hutchins S.	PS
Johnson C. D. PS Kamber I. PS Koziol, H. PS Mathematical States Metral G. PS Metral G. PS Metral G. PS Millich A. SL Pearce P. PS Riche A.J. PS Schnell W. Bat. 584 Schreiber S. AT Suberlucq G. PS Thomi J.C. PS Warner D.J. PS Wilson I. SL Wuensch W. SL Durand J. PS Pincott B. PS	Jensen E.	PS
Kamber I.PSKöziol, H.PSKöziol, H.PSKöziol, H.PSKagler H.PSMattsen J.H.B.PSMetral G.PSMetral G.PSMillich A.SLPearce P.PSPotier JP.PSRiche A.J.PSRiege HansATRinolfi L.PSSchnell W.Bat. 584Schnell W.Bat. 584Schreiber S.ATSuberlucq G.PSThorndahl L.PSWarner D.J.PSWilson I.SLDurand J.PSMourier J.PSMarker M.PSMarker M.PSMarker M.PS	Johnson C. D.	PS
Koziol, H.PSKngler H.PSLe Gras MPSMattsen J.H.B.PSMetral G.PSMetral G.PSMillich A.SLPearce P.PSRiche A.J.PSRiche A.J.PSRiche A.J.PSRiche A.J.PSRiche A.J.PSSchnell W.Bat. 584Schnell W.Bat. 584Schnell W.PSSchnell W.PSMarner D.J.PSWilson I.SLWuensch W.SLDurand J.PSMourier J.PSMourier J.PSMourier J.PSMourier J.PSMourier J.PSMourier J.PSMourier J.PSMarsderPSMourier J.PSMourier J.PSMourier J.PSMourier J.PSMourier J.PSMourier J.PSMarsderPS	Kamber I.	PS
Kingler H.PSLe Gras MPSMattsen J.H.B.PSMetral G.PSMitchallichenko A.PSMillich A.SLPearce P.PSPotier JP.PSRiche A.J.PSRiche A.J.PSRiche A.J.PSRiche A.J.PSSchnelt W.Bat. 584Schnelt W.Bat. 584Schnelt W.Bat. 584Schnelt W.PSSchnelt W.PSSchnelt W.PSSchnelt W.SLWarner D.J.PSWilson I.SLDurand J.PSMourier J.PSPincott B.PS	Koziol, H.	PS
Let Gras MPSMathsen J.H.B.PSMetral G.PSMillich A.PSMillich A.SLPearce P.PSPotier JP.PSRiche A.J.PSRiege HansATRinolfi L.PSRossat G.PSSchnell W.Bat. 584Schnell W.Bat. 584Schnell W.PSSchnell W.PSSchnell W.PSSchnell W.SLWarner D.J.PSWilson I.SLWuensch W.SLDurand J.PSMourier J.PSPincott B.PS		PS
Metral G. PS Metral G. PS Millich A. PS Millich A. SL Pearce P. PS Potier JP. PS Riche A.J. PS Riege Hans AT Rimolfi L. PS Rossat G. PS Schnell W. Bat. 584 Schreiber S. AT Suberlucq G. PS Thomi J.C. PS Warner D.J. PS Wilson I. SL Wuensch W. SL Durand J. PS Mourier J. PS Mourier J. PS Mourier J. PS	Le Gras M	PS
Metral G. Mitchallichenko A. PS Millich A. Pearce P. Potier JP. Riche A.J. Riche A.J. Riche A.J. Riche A.J. Schreiber J. Schnell W. Schreiber S. Schnell W. Schreiber S. Thomi J.C. Warner D.J. Warner D.J. Wilson I. Wuensch W. Durand J. PS Mourier J. PS Pincott B. PS	- Madisen J.H.B.	PS m
Millich A. PS Millich A. SL Pearce P. PS Riche A.J. PS Riege Hans AT Rinolfi L. PS Rossat G. PS Schnell W. Bat. 584 Schreiber S. AT Suberlucq G. PS Thomi J.C. PS Marner D.J. PS Wilson I. SL Wuensch W. SL Durand J. PS Pincott B. PS	Metral C.	15
Pearce P. PS Potier JP. PS Riche A.J. PS Riege Hans AT -Rimolfi L. PS Rossat G. PS Schnell W. Bat. 584 -Schreiber S. AT Suberlucq G. PS Thomi J.C. PS -Thomdaht L. PS Warner D.J. PS Wilson I. SL Wuensch W. SL Durand J. PS Pincott B. PS	Millich A	
Potier JP. PS Potier JP. PS Riche A.J. PS Riege Hans AT -Rimolfi L. PS -Rossat G. PS Schnell W. Bat. 584 -Schreiber S. AT Suberlucy G. PS Thomi J.C. PS -Thorndaltt L. PS Warner D.J. PS Wilson I. SL -Wuensch W. SL Durand J. PS Pincott B. PS	Peerco P	SL DC
Riche A.J.PSRiege HansATRinolfi L.PSRossat G.PSSchnell W.Bat. 584Schnell W.Bat. 584Schreiber S.ATSuberlucq G.PSThomi J.C.PSWarner D.J.PSWilson I.SLDurand J.PSMourier J.PSPincott B.PS	- Pearce F.	1'5 DC
Riege Hans AT Rinolfi L. PS Rossat G. PS Schnell W. Bat. 584 Schreiber S. AT Suberlucq G. PS Thomi J.C. PS Thomi J.C. PS Warner D.J. PS Wilson I. SL Wuensch W. SL Durand J. PS Pincott B. PS	Picho A La	F5 DC
Rinolfi L. PS Rossat G. PS Schnell W. Bat. 584 Schnell W. PS Thomi J.C. PS Warner D.J. PS Wilson I. SL Wuensch W. SL Durand J. PS Mourier J. PS Pincott B. PS	Riogo Hans	Г5 АТ
Rossat G.PSSchnell W.Bat. 584Schreiber S.ATSuberlucq G.PSThomi J.C.PSThomi J.C.PSWarner D.J.PSWilson I.SLWuensch W.SLDurand J.PSMourier J.PSHowstp.PS	Pinelfi I	DC AI
Schnell W. Bat. 584 Schreiber S. AT Suberlucq G. PS Thomi J.C. PS Thomi J.C. PS Warner D.J. PS Wilson I. SL Wuensch W. SL Durand J. PS Pincott B. PS Harden S. AT Statement of the second s	Rosent C	PC
Schreiber S. Suberlucq G. Thomi J.C. PS Thomi J.C. PS Warner D.J. Warner D.J. PS Wilson I. Durand J. PS PS PS PS PS PS PS PS PS PS		F5 R41 594
Thomi J.C. PS — Thomdaht L. PS — Warner D.J. PS Wilson I. SL — Wuensch W. SL — Durand J. PS — Mourier J. PS — Pincott B. PS — U.S. PS	Suberlyon C	
	Thomi LC-	PS
Warner D.J PS Wilson I. SL Wuensch W. SL Durand J PS Mourier J. PS Pincott B. PS	-Thorndaht 1	PS
Wilson I. SL <u>Wuensch W.</u> SL <u>Durand J.</u> PS <u>Mourier J.</u> PS <u>Pincott B.</u> PS <u>Utastpue</u>		PS
<u>Wuensch W.</u> SL <u>Durand J.</u> PS <u>Mourier J.</u> PS <u>Pincott B.</u> PS	Wilson I	SI
<u>Durand J.</u> <u>Mourier J.</u> <u>Pincott B.</u> <u>PS</u> <u>Durand J.</u> PS PS <u>PS</u>	Wuensch W	SI
	Durand I	PS
Pincott B. PS	Mourier I	PS
Hastpur	Pincott B.	PS
- thank -		
	-ttosten	