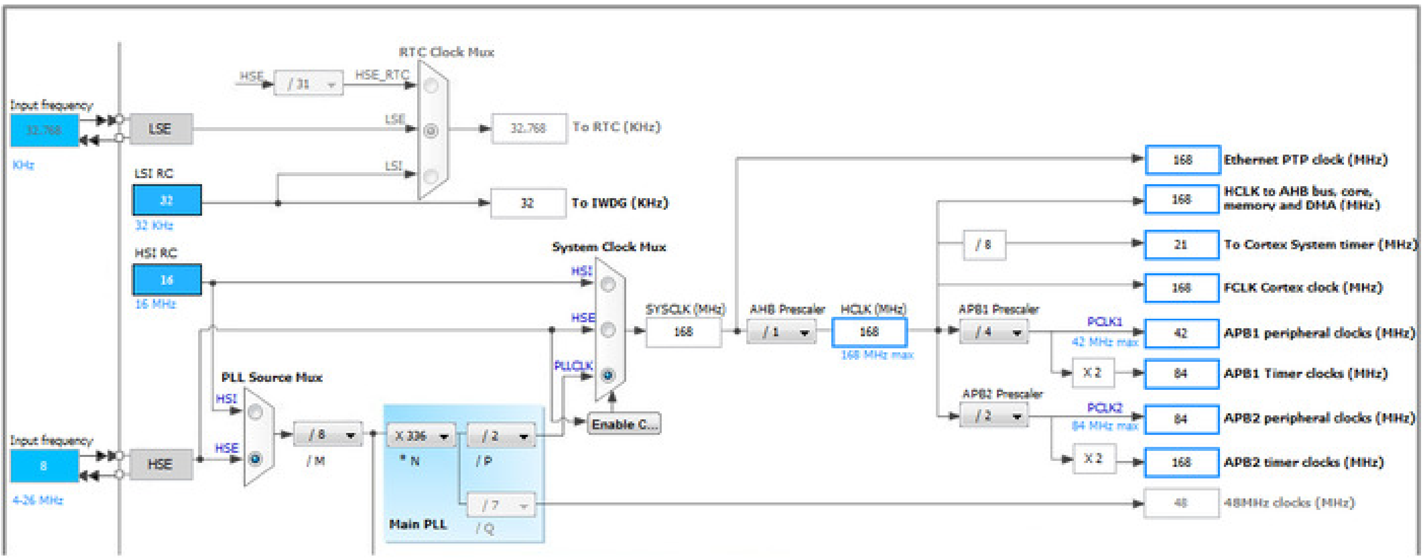
Hi

I have started a new project. I need to set 3xSPI at max speed. I'm using the discovery board with a STM32F407VGT6. This board has a 8mhz christal.

I'm using cube, it is a nice tool that i'm starting to use with this project. I have configured the clocking setting in cube for this board to get the max speed possible in theory (check attached image and code)



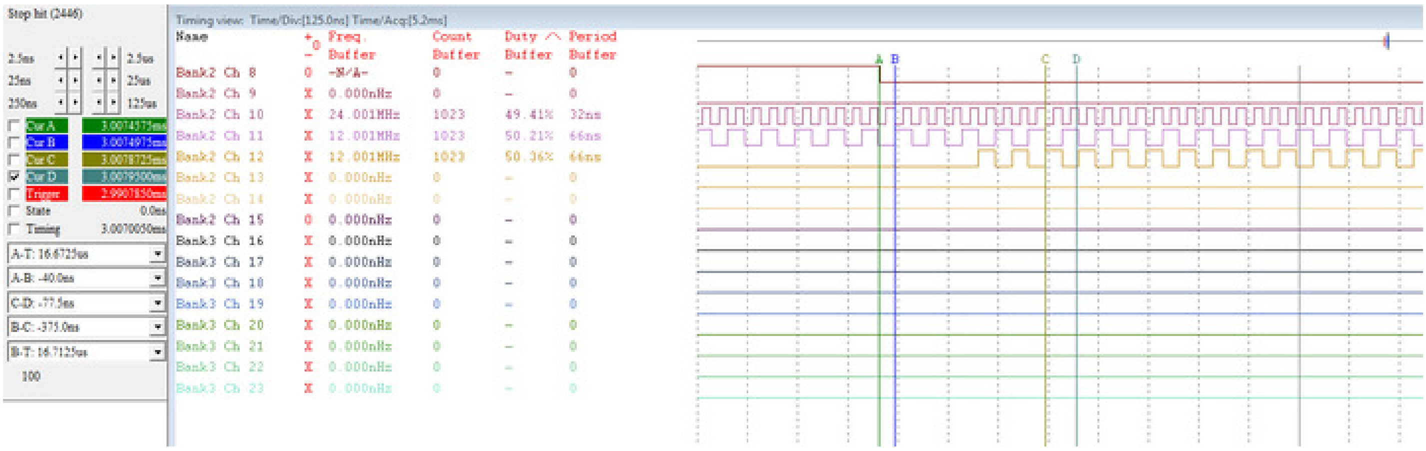
The initialization code is (only the dma/spi/clock functions are included):

```
void SystemClock_Config(void)
{

  RCC_OscInitTypeDef RCC_OscInitStruct;
  RCC_ClkInitTypeDef RCC_ClkInitStruct;

  __PWR_CLK_ENABLE();

  __HAL_PWR_VOLTAGESCALING_CONFIG(PWR_REGULATOR_VOLTAGE_SCALE1);

  RCC_OscInitStruct.OscillatorType = RCC_OSCILLATORTYPE_LSI|RCC_OSCILLATORTYPE_HSE;
  RCC_OscInitStruct.HSEState = RCC_HSE_ON;
  RCC_OscInitStruct.LSIState = RCC_LSI_ON;
  RCC_OscInitStruct.PLL.PLLState = RCC_PLL_ON;
  RCC_OscInitStruct.PLL.PLLSource = RCC_PLLSOURCE_HSE;
  RCC_OscInitStruct.PLL.PLLM = 8;
  RCC_OscInitStruct.PLL.PLLN = 192;
  RCC_OscInitStruct.PLL.PLLP = RCC_PLLP_DIV2;
  RCC_OscInitStruct.PLL.PLLQ = 7;
  HAL_RCC_OscConfig(&RCC_OscInitStruct);

  RCC_ClkInitStruct.ClockType = RCC_CLOCKTYPE_SYSCLK|RCC_CLOCKTYPE_PCLK1
                              |RCC_CLOCKTYPE_PCLK2;
  RCC_ClkInitStruct.SYSCLKSource = RCC_SYSCLKSOURCE_PLLCLK;
  RCC_ClkInitStruct.AHBCLKDivider = RCC_SYSCLK_DIV1;
  RCC_ClkInitStruct.APB1CLKDivider = RCC_HCLK_DIV4;
  RCC_ClkInitStruct.APB2CLKDivider = RCC_HCLK_DIV2;
  HAL_RCC_ClockConfig(&RCC_ClkInitStruct, FLASH_LATENCY_5);

}


void MX_SPI1_Init(void)
{

  hspi1.Instance = SPI1;
  hspi1.Init.Mode = SPI_MODE_MASTER;
  hspi1.Init.Direction = SPI_DIRECTION_2LINES;
  hspi1.Init.DataSize = SPI_DATASIZE_8BIT;
  hspi1.Init.CLKPolarity = SPI_POLARITY_LOW;
  hspi1.Init.CLKPhase = SPI_PHASE_1EDGE;
  hspi1.Init.NSS = SPI_NSS_SOFT;
  hspi1.Init.BaudRatePrescaler = SPI_BAUDRATEPRESCALER_2;
  hspi1.Init.FirstBit = SPI_FIRSTBIT_LSB;
  hspi1.Init.TIMode = SPI_TIMODE_DISABLED;
  hspi1.Init.CRCCalculation = SPI_CRCCALCULATION_DISABLED;
  HAL_SPI_Init(&hspi1);

}

/* SPI2 init function */
void MX_SPI2_Init(void)
{

  hspi2.Instance = SPI2;
  hspi2.Init.Mode = SPI_MODE_MASTER;
  hspi2.Init.Direction = SPI_DIRECTION_2LINES;
  hspi2.Init.DataSize = SPI_DATASIZE_8BIT;
  hspi2.Init.CLKPolarity = SPI_POLARITY_LOW;
  hspi2.Init.CLKPhase = SPI_PHASE_1EDGE;
  hspi2.Init.NSS = SPI_NSS_SOFT;
  hspi2.Init.BaudRatePrescaler = SPI_BAUDRATEPRESCALER_2;
  hspi2.Init.FirstBit = SPI_FIRSTBIT_LSB;
  hspi2.Init.TIMode = SPI_TIMODE_DISABLED;
  hspi2.Init.CRCCalculation = SPI_CRCCALCULATION_DISABLED;
  HAL_SPI_Init(&hspi2);

}

/* SPI3 init function */
void MX_SPI3_Init(void)
{

  hspi3.Instance = SPI3;
  hspi3.Init.Mode = SPI_MODE_MASTER;
  hspi3.Init.Direction = SPI_DIRECTION_2LINES;
  hspi3.Init.DataSize = SPI_DATASIZE_8BIT;
  hspi3.Init.CLKPolarity = SPI_POLARITY_LOW;
  hspi3.Init.CLKPhase = SPI_PHASE_1EDGE;
  hspi3.Init.NSS = SPI_NSS_SOFT;
  hspi3.Init.BaudRatePrescaler = SPI_BAUDRATEPRESCALER_2;
  hspi3.Init.FirstBit = SPI_FIRSTBIT_LSB;
  hspi3.Init.TIMode = SPI_TIMODE_DISABLED;
  hspi3.Init.CRCCalculation = SPI_CRCCALCULATION_DISABLED;
  HAL_SPI_Init(&hspi3);

}

void MX_DMA_Init(void)
{
  /* DMA controller clock enable */
  __DMA1_CLK_ENABLE();
  __DMA2_CLK_ENABLE();

  /* DMA interrupt init */
  HAL_NVIC_SetPriority(DMA1_Stream4_IRQn, 0, 0);
  HAL_NVIC_EnableIRQ(DMA1_Stream4_IRQn);
  HAL_NVIC_SetPriority(DMA2_Stream3_IRQn, 0, 0);
  HAL_NVIC_EnableIRQ(DMA2_Stream3_IRQn);
  HAL_NVIC_SetPriority(DMA1_Stream5_IRQn, 0, 0);
  HAL_NVIC_EnableIRQ(DMA1_Stream5_IRQn);

}
```

```
void HAL_SPI_MspInit(SPI_HandleTypeDef* hspi)
{

  GPIO_InitTypeDef GPIO_InitStruct;
  if(hspi->Instance==SPI1)
  {
  /* USER CODE BEGIN SPI1_MspInit 0 */

  /* USER CODE END SPI1_MspInit 0 */
    /* Peripheral clock enable */
    __SPI1_CLK_ENABLE();

    /**SPI1 GPIO Configuration
    PA5     ------> SPI1_SCK
    PA6     ------> SPI1_MISO
    PA7     ------> SPI1_MOSI
    */
    GPIO_InitStruct.Pin = GPIO_PIN_5|GPIO_PIN_6|GPIO_PIN_7;
    GPIO_InitStruct.Mode = GPIO_MODE_AF_PP;
    GPIO_InitStruct.Pull = GPIO_NOPULL;
    GPIO_InitStruct.Speed = GPIO_SPEED_HIGH;
    GPIO_InitStruct.Alternate = GPIO_AF5_SPI1;
    HAL_GPIO_Init(GPIOA, &GPIO_InitStruct);

    /* Peripheral DMA init*/

    hdma_spi1_tx.Instance = DMA2_Stream3;
    hdma_spi1_tx.Init.Channel = DMA_CHANNEL_3;
    hdma_spi1_tx.Init.Direction = DMA_MEMORY_TO_PERIPH;
    hdma_spi1_tx.Init.PeriphInc = DMA_PINC_DISABLE;
    hdma_spi1_tx.Init.MemInc = DMA_MINC_ENABLE;
    hdma_spi1_tx.Init.PeriphDataAlignment = DMA_PDATAALIGN_BYTE;
    hdma_spi1_tx.Init.MemDataAlignment = DMA_MDATAALIGN_BYTE;
    hdma_spi1_tx.Init.Mode = DMA_NORMAL;
    hdma_spi1_tx.Init.Priority = DMA_PRIORITY_VERY_HIGH;
    hdma_spi1_tx.Init.FIFOMode = DMA_FIFOMODE_DISABLE;
    HAL_DMA_Init(&hdma_spi1_tx);

    __HAL_LINKDMA(hspi,hdmatx,hdma_spi1_tx);

  /* USER CODE BEGIN SPI1_MspInit 1 */

  /* USER CODE END SPI1_MspInit 1 */
  }
  else if(hspi->Instance==SPI2)
  {
  /* USER CODE BEGIN SPI2_MspInit 0 */

  /* USER CODE END SPI2_MspInit 0 */
    /* Peripheral clock enable */
    __SPI2_CLK_ENABLE();

    /**SPI2 GPIO Configuration
    PC2     ------> SPI2_MISO
    PC3     ------> SPI2_MOSI
    PB13     ------> SPI2_SCK
    */
    GPIO_InitStruct.Pin = GPIO_PIN_2|GPIO_PIN_3;
    GPIO_InitStruct.Mode = GPIO_MODE_AF_PP;
    GPIO_InitStruct.Pull = GPIO_NOPULL;
    GPIO_InitStruct.Speed = GPIO_SPEED_HIGH;
    GPIO_InitStruct.Alternate = GPIO_AF5_SPI2;
    HAL_GPIO_Init(GPIOC, &GPIO_InitStruct);

    GPIO_InitStruct.Pin = GPIO_PIN_13;
    GPIO_InitStruct.Mode = GPIO_MODE_AF_PP;
    GPIO_InitStruct.Pull = GPIO_NOPULL;
    GPIO_InitStruct.Speed = GPIO_SPEED_HIGH;
    GPIO_InitStruct.Alternate = GPIO_AF5_SPI2;
    HAL_GPIO_Init(GPIOB, &GPIO_InitStruct);

    /* Peripheral DMA init*/

    hdma_spi2_tx.Instance = DMA1_Stream4;
    hdma_spi2_tx.Init.Channel = DMA_CHANNEL_0;
    hdma_spi2_tx.Init.Direction = DMA_MEMORY_TO_PERIPH;
    hdma_spi2_tx.Init.PeriphInc = DMA_PINC_DISABLE;
    hdma_spi2_tx.Init.MemInc = DMA_MINC_ENABLE;
    hdma_spi2_tx.Init.PeriphDataAlignment = DMA_PDATAALIGN_BYTE;
    hdma_spi2_tx.Init.MemDataAlignment = DMA_MDATAALIGN_BYTE;
    hdma_spi2_tx.Init.Mode = DMA_NORMAL;
    hdma_spi2_tx.Init.Priority = DMA_PRIORITY_VERY_HIGH;
    hdma_spi2_tx.Init.FIFOMode = DMA_FIFOMODE_DISABLE;
    HAL_DMA_Init(&hdma_spi2_tx);

    __HAL_LINKDMA(hspi,hdmatx,hdma_spi2_tx);

  /* USER CODE BEGIN SPI2_MspInit 1 */

  /* USER CODE END SPI2_MspInit 1 */
  }
  else if(hspi->Instance==SPI3)
  {
  /* USER CODE BEGIN SPI3_MspInit 0 */

  /* USER CODE END SPI3_MspInit 0 */
    /* Peripheral clock enable */
    __SPI3_CLK_ENABLE();

    /**SPI3 GPIO Configuration
    PC10     ------> SPI3_SCK
    PC11     ------> SPI3_MISO
    PC12     ------> SPI3_MOSI
    */
    GPIO_InitStruct.Pin = GPIO_PIN_10|GPIO_PIN_11|GPIO_PIN_12;
    GPIO_InitStruct.Mode = GPIO_MODE_AF_PP;
    GPIO_InitStruct.Pull = GPIO_NOPULL;
    GPIO_InitStruct.Speed = GPIO_SPEED_HIGH;
    GPIO_InitStruct.Alternate = GPIO_AF6_SPI3;
    HAL_GPIO_Init(GPIOC, &GPIO_InitStruct);

    /* Peripheral DMA init*/

    hdma_spi3_tx.Instance = DMA1_Stream5;
    hdma_spi3_tx.Init.Channel = DMA_CHANNEL_0;
    hdma_spi3_tx.Init.Direction = DMA_MEMORY_TO_PERIPH;
    hdma_spi3_tx.Init.PeriphInc = DMA_PINC_DISABLE;
    hdma_spi3_tx.Init.MemInc = DMA_MINC_ENABLE;
    hdma_spi3_tx.Init.PeriphDataAlignment = DMA_PDATAALIGN_BYTE;
    hdma_spi3_tx.Init.MemDataAlignment = DMA_MDATAALIGN_BYTE;
    hdma_spi3_tx.Init.Mode = DMA_NORMAL;
    hdma_spi3_tx.Init.Priority = DMA_PRIORITY_VERY_HIGH;
    hdma_spi3_tx.Init.FIFOMode = DMA_FIFOMODE_DISABLE;
    HAL_DMA_Init(&hdma_spi3_tx);

    __HAL_LINKDMA(hspi,hdmatx,hdma_spi3_tx);

  /* USER CODE BEGIN SPI3_MspInit 1 */

  /* USER CODE END SPI3_MspInit 1 */
  }

}
```

```
int main(void)
{

  /* USER CODE BEGIN 1 */

  /* USER CODE END 1 */

  /* MCU Configuration----------------------------------------------------------*/

  /* Reset of all peripherals, Initializes the Flash interface and the Systick. */
  HAL_Init();

  /* Configure the system clock */
  SystemClock_Config();

  /* Initialize all configured peripherals */
  MX_GPIO_Init();
  MX_DMA_Init();
  MX_IWDG_Init();
  MX_SPI1_Init();
  MX_SPI2_Init();
  MX_SPI3_Init();
  MX_TIM2_Init();
  MX_TIM3_Init();
  MX_TIM4_Init();
  MX_TIM5_Init();
  MX_TIM9_Init();

  /* USER CODE BEGIN 2 */

  /* USER CODE END 2 */

  /* Infinite loop */
  /* USER CODE BEGIN WHILE */
  while (1)
  {
  /* USER CODE END WHILE */

  /* USER CODE BEGIN 3 */
    // Led On
    HAL_GPIO_WritePin(GPIOD, GPIO_PIN_15, GPIO_PIN_SET);

  if(HAL_SPI_Transmit_DMA(&hspi1, (uint8_t*)aTxBuffer, strlen((const char *) aTxBuffer)) != HAL_OK)
    Error_Handler();
  if(HAL_SPI_Transmit_DMA(&hspi2, (uint8_t*)aTxBuffer, strlen((const char *) aTxBuffer)) != HAL_OK)
    Error_Handler();
  if(HAL_SPI_Transmit_DMA(&hspi3, (uint8_t*)aTxBuffer, strlen((const char *) aTxBuffer)) != HAL_OK)
    Error_Handler();



    // Pause
    //Soft_Delay(0x000FFFFF);

    // Led Off
    HAL_GPIO_WritePin(GPIOD, GPIO_PIN_15,GPIO_PIN_RESET);



    // Pause
    Soft_Delay(0x000FFFFF);
  }
  /* USER CODE END 3 */

}
```

as result I get :



☐ Cur A 3.0074575ms
☐ Cur B 3.0074975ms
☐ Cur C 3.0078725ms
☑ Cur D 3.0079500ms
☐ Trigger 2.9907850ms
☐ State 0.0ms
☐ Timing 3.0070050ms

A-T: 16.6725us
A-B: -40.0ns
C-D: -77.5ns
B-C: -375.0ns
B-T: 16.7125us
100

Timing view: Time/Div:[125.0ns] Time/Acq:[5.2ms]

Name	+0 -	Freq. Buffer	Count Buffer	Duty ^ Buffer	Period Buffer
Bank2 Ch 8	0	-N/A-	0	-	0
Bank2 Ch 9	X	0.000nHz	0	-	0
Bank2 Ch 10	X	24.001MHz	1023	49.41%	32ns
Bank2 Ch 11	X	12.001MHz	1023	50.21%	66ns
Bank2 Ch 12	X	12.001MHz	1023	50.36%	66ns
Bank2 Ch 13	X	0.000nHz	0	-	0
Bank2 Ch 14	X	0.000nHz	0	-	0
Bank2 Ch 15	0	0.000nHz	0	-	0
Bank3 Ch 16	X	0.000nHz	0	-	0
Bank3 Ch 17	X	0.000nHz	0	-	0
Bank3 Ch 18	X	0.000nHz	0	-	0
Bank3 Ch 19	X	0.000nHz	0	-	0
Bank3 Ch 20	X	0.000nHz	0	-	0
Bank3 Ch 21	X	0.000nHz	0	-	0
Bank3 Ch 22	X	0.000nHz	0	-	0
Bank3 Ch 23	X	0.000nHz	0	-	0

In theory I have set all to the max speed with the clocking. APB1 is at 42 mhz (spis 2 and 3) and APB2 is 84mhz (SPI 1). This would make a 21 mbits spi for spi 2 & 3 and 42 mbits for spi 1, but instead as you can see in the other image I get 24mbits and 12mbits (It is not even a mult of the base frequency APB1/APB2)